# 2018
# LOUISIANA WATER QUALITY INVENTORY: INTEGRATED REPORT

## FULFILLING REQUIREMENTS OF THE FEDERAL CLEAN WATER ACT, SECTIONS 305(b) AND 303(d)

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The 2018 Water Quality Integrated Report is dedicated to Clara "Pat" Hindrichs, who passed away July 27, 2018 at the age of 92. Back together with her loving husband, Vince.

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## Acronyms and Abbreviations

| | |
|---|---|
| AGR | Agriculture |
| AL | Action Level |
| AOI | Area of Interest |
| ASSET | Aquifer Sampling and Assessment Program |
| AWQMN | Ambient Water Quality Monitoring Network |
| BEACH | Beaches Environmental Assessment and Coastal Health |
| BEP | Beneficial Environmental Projects |
| BFI | Browning-Ferris Industries |
| BMP | Best Management Practices |
| BOD | Biochemical Oxygen Demand |
| BP | British Petroleum |
| BT | Barataria-Terrebonne |
| CALM | Consolidated Assessment and Listing Methodology |
| CAP | Corrective Action Plan |
| CEI | Compliance Evaluation Inspections |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFDA | Catalog of Federal Domestic Assistance |
| CFR | Code of Federal Regulations |
| CM | Continuous Monitoring |
| CPRA | Coastal Protection and Restoration Authority |
| CSI | Compliance Sampling Inspections |
| CWA | Clean Water Act |
| CWSRF | Clean Water State Revolving Fund |
| DO | Dissolved Oxygen |
| DWS | Drinking Water Supply |
| EDMS | Electronic Document Management System |
| EQIP | Environmental Quality Incentive Program |
| ERMA | Environmental Response Management Application |
| FDA | Food and Drug Administration |
| FERC | Federal Energy Regulatory Commission |
| FWP | Fish and Wildlife Propagation |
| HCB | Hexachlorobenzene |
| HCBD | Hexachlorobutadiene |
| HUC | Hydrological Unit Code |
| IR | Integrated Report |
| IRC | Integrated Report Category |
| LAC | Louisiana Administrative Code |
| LAIS | Louisiana Aquatic Invasive Species |
| LAL | Limited Aquatic Life and Wildlife |
| LCH | Liquid Chlorinated Hydrocarbons |
| LDAF | Louisiana Department of Agriculture and Forestry |
| LDCRT | Louisiana Department of Culture, Recreation and Tourism |
| LDEQ | Louisiana Department of Environmental Quality |
| LDH | Louisiana Department of Health |
| LDNR | Louisiana Department of Natural Resources |

## Acronyms and Abbreviations

| | |
|---|---|
| LDWF | Louisiana Department of Wildlife and Fisheries |
| LEADMS | Louisiana Environmental Analytical Data Management System |
| LEAU | Louisiana Environmental Assessment Utility |
| LEQA | Louisiana Environmental Quality Act |
| LMRAP | Lower Mississippi River Alluvial Plain |
| LOSP | Louisiana Office of State Parks |
| LOT | Louisiana Office of Tourism |
| LPBF | Lake Pontchartrain Basin Foundation |
| LPDES | Louisiana Pollution Discharge Elimination System |
| LSP | Louisiana State Police |
| LSU | Louisiana State University |
| LSUS | Louisiana State University Shreveport |
| LTSA | Louisiana Tourism Satellite Account |
| LUMCON | Louisiana Universities Marine Consortium |
| MCL | Maximum Contaminant Level |
| MDL | Method Detection Limit |
| MS4 | Municipal Separate Storm Sewer Systems |
| MS | Mousse |
| MSU | McNeese State University |
| NANPCA | Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 |
| NARS | National Aquatic Resource Surveys |
| ND | Non-Detect |
| NOAA | National Oceanic and Atmospheric Administration |
| NOO | No Oil Observed |
| NPDES | National Pollutant Discharge Elimination System |
| NPL | National Priorities List |
| NPS | Nonpoint Source Pollution |
| NRCS | Natural Resources Conservation Service |
| NRDA | Natural Resource Damage Assessment |
| NTU | Nephelometric Turbidity Unit |
| NWCA | National Wetland Conditions Assessment |
| OEC | Office of Environmental Compliance |
| OES | Office of Environmental Services |
| ONR | Outstanding Natural Resource Waters |
| OVM | Oiled Vegetative Material |
| OYS | Oyster Propagation |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PCB | Polychlorinated Biphenyls |
| PCR | Primary Contact Recreation |
| PS | Point Source |
| QA/QC | Quality Assurance/Quality Control |
| QAPP | Quality Assurance Project Plan |
| RCRA | Resource Conservation and Recovery Act |
| RECAP | Risk Evaluation/Corrective Action Program |
| RES | Rollins Environmental Services |

## Acronyms and Abbreviations

| | |
|---|---|
| ROD | Record of Decision |
| RPP | Remedial Project Plan |
| SARA | Superfund Amendments and Reauthorization Act |
| SCAT | Shoreline Cleanup Assessment Team |
| SCPF | South Central Plains Flatwoods |
| SCPSTU | South Central Plains Southern Tertiary Uplands |
| SCPTU | South Central Plains Tertiary Uplands |
| SCR | Secondary Contact Recreation |
| SD | Surveillance Division |
| SEAFWA | Southeastern Association of Fish and Wildlife Agencies |
| SEAMAP | Gulf States Marine Fisheries Commission, Southeast Area Monitoring and Assessment Program |
| SMB | Surface, Middle, Bottom |
| SMCL | Secondary Maximum Contaminant Level |
| SONRIS | Strategic Online Natural Resources Information System |
| SOP | Standard Operating Procedure |
| SPOC | Single Point of Contact |
| SR | Surface Residue |
| SRB | Surface oil Residue Balls |
| STPG | St. Tammany Parish Government |
| sVGP | Small Vessel General Permit |
| SVOC | Semi-Volatile Organic Compound |
| SWPP | Source Water Protection Program |
| TDS | Total Dissolved Solids |
| TGP | Tennessee Gas Pipeline |
| TKN | Total Kjeldahl Nitrogen |
| TMDL | Total Maximum Daily Load |
| TN | Total Nitrogen |
| TP | Total Phosphorus |
| TSS | Total Suspended Solids |
| TU | Terrace Uplands |
| UAA | Use Attainability Analysis |
| UMRAP | Upper Mississippi River Alluvial Plains |
| UNO | University of New Orleans |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USFS | United States Forest Service |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| VGP | Vessel General Permit |
| VOC | Volatile Organic Compound |
| WES | Water Enforcement Section |
| WHIP | Wildlife Habitat Incentive Program |
| WIC | Water Body Impairment Combination |
| WIP | Watershed Implementation Plan |

## Acronyms and Abbreviations

| | |
|---|---|
| WPAD | Water Planning and Assessment Division |
| WQS | Water Quality Standards |
| WQU | Water Quality Unit |
| WQX | Water Quality Exchange |
| WRP | Wetland Reserve Program |

# PART I: EXECUTIVE SUMMARY/OVERVIEW

## Summary of Louisiana's Water Quality Assessment Program

Louisiana, well known for its abundance of water resources, contains over 66,294 miles of rivers and streams, 1,078,031 acres (1,684 square miles) of lakes and reservoirs, 5,550,951 acres (8,673 square miles) of fresh and tidal wetlands, and 4,899,840 acres (7,656 square miles) of estuaries. These figures, some of which are taken from the U.S. Environmental Protection Agency's (USEPA) River Reach 3 file, are known to be low in comparison to the actual total area of Louisiana's rivers, lakes, wetlands, and estuaries. It is the responsibility of the Louisiana Department of Environmental Quality (LDEQ) to protect the chemical, physical, biological, and aesthetic integrity of the water resources and aquatic environment of Louisiana. This responsibility is undertaken through the use of public education, scientific endeavors, water quality management, wastewater permitting and inspections, and regulatory enforcement in order to provide the citizens of Louisiana with clean and healthy water now and in the future.

The 2018 Integrated Report (IR) documents LDEQ's progress toward meeting this responsibility. Louisiana's IR is produced, in part, to meet requirements of the Federal Water Pollution Control Act commonly known as the Clean Water Act (CWA) (U.S. Code 1972, 1987). The primary CWA sections addressed by the 2018 IR are § 303(d) and § 305(b). Section 303(d) states that each state shall identify water quality-limited segments still requiring Total Maximum Daily Loads (TMDL) within its boundaries for which: (1) Technology-based effluent limitations required by sections 301(b), 306, 307 or other sections of the Act; (2) More stringent effluent limitations (including prohibitions) required by either state or local authority preserved by § 510 of the Act or federal authority (law, regulation, or treaty); and (3) Other pollution control requirements (e.g., best management practices) required by local, state, or federal authority are not stringent enough to implement any water quality standards applicable to such waters.

Section 305(b) of the CWA requires each state to provide, every two years, the following information to the Administrator of the USEPA:

- A description of the water quality of all navigable waters in the state
- An analysis of the status of waters of the state with regard to their support of recreational activities and fish and wildlife propagation
- An assessment of the state's water pollution control activities toward achieving the CWA goal of having water bodies that support recreational activities and fish and wildlife propagation
- An estimate of the costs and benefits of implementing the CWA
- A description of the nature and extent of nonpoint sources (NPS) of pollution and recommendations for programs to address NPS pollution

For the 2018 IR, LDEQ used USEPA's *Consolidated Assessment and Listing Methodology* (CALM) (USEPA 2002), which contains the IR guidance, as well as USEPA's guidance document, *Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act* (USEPA 2005). In addition to the previous two documents, USEPA issues updates to the IR guidance in the form of memoranda prior to each IR period (USEPA 2006). Louisiana's water quality regulations (Louisiana Administrative Code (LAC), Title 33:IX.1101 et seq. (LAC 2015)) were used to determine water quality uses, criteria, and assessment procedures. One of the primary focuses of USEPA's IR guidance is on the use of

categories to which water bodies or water body/impairment combinations may be assigned. A water body/impairment combination (WIC) is a single parameter (e.g., low dissolved oxygen (DO)) or other impairment assigned to a water body subsegment for assessment purposes. Subsegments are watersheds or portions of watersheds delineated as management units for water quality monitoring, assessment, permitting, inspection, and enforcement purposes. Categorization under IR guidance allows for a more focused approach to water quality management by clearly determining which actions are required to protect or improve individual waters of the state. The eight IR categories used by LDEQ can be found in Table 1.1.1.

**Table 1.1.1**

**U.S. Environmental Protection Agency Integrated Report Methodology guidance categories used to categorize water body/impairment combinations for the *Louisiana 2018 Integrated Report*; includes IRC 5RC and IRC 5-Alt developed by LDEQ and approved by U.S. Environmental Protection Agency.**

| IR Category (IRC) | IR Category Description |
|---|---|
| IRC 1 | *Specific Water body Impairment Combination* (WIC) cited on a *previous* § 303(d) list is now attaining all uses and standards. Also used for water bodies that are fully supporting all designated uses. |
| IRC 2 | Water body is meeting some uses and standards but there is insufficient data to determine if uses and standards *associated with the specific WIC* cited are being attained. |
| IRC 3 | There is insufficient data to determine if uses and standards *associated with the specific WIC* cited are being attained. |
| IRC 4a | WIC exists and a TMDL has been completed for the *specific WIC* cited. |
| IRC 4b | WIC exists and control measures other than a TMDL are expected to result in attainment of designated uses *associated with the specific WIC* cited. |
| IRC 4c | WIC exists and a pollutant (anthropogenic source) does not cause the *specific WIC* cited. |
| IRC 5 | WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited. **IRC 5 and its subcategories of IRC 5RC and IRC 5-Alt represent Louisiana's § 303(d) list.** |
| IRC 5RC (Revise Criteria) | WIC exists for one or more uses and a TMDL is required for *the specific WIC* cited; LDEQ will investigate revising criteria due to the possibility that natural conditions may be the source of the water quality criteria impairments. **IRC 5RC WICs are on Louisiana's § 303(d) list.** |

**Table 1.1.1**

**U.S. Environmental Protection Agency Integrated Report Methodology guidance categories used to categorize water body/impairment combinations for the *Louisiana 2018 Integrated Report*; includes IRC 5RC and IRC 5-Alt developed by LDEQ and approved by U.S. Environmental Protection Agency.**

| IR Category (IRC) | IR Category Description |
|---|---|
| IRC 5-Alt (Alternative) | WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited; however, based on the § 303(d) long-term vision protocol an alternative approach is expected to achieve water quality goals. **IRC 5-Alt WICs are on Louisiana's § 303(d) list.** |

On April 20, 2010, British Petroleum's (BP's) Deepwater Horizon drilling rig operating in the Gulf of Mexico approximately 50 miles off the Mississippi River Delta exploded and sank. The resulting oil spill affected a large portion of Louisiana's coastline.

For the 2018 IR, the six remaining partial subsegments identified in the 2016 IR were reassessed by onsite visual evaluations conducted from January – March of 2018. Based on these reevaluations, all six areas (Table 3.2.8) were determined to now be fully supporting the previously impaired designated use of primary contact recreation (PCR). There was No Oil Observed (NOO) at two of the six areas. Limited occurrences of Surface oil Residue Balls (SRBs) were observed at three of the areas. Reassessment of one area resulted in the observation of SRBs, Surface Residue (SR), Mousse (MS), and Oiled Vegetative Material (OVM). However, the observed SRBs, SR, MS and OVM were determined to be spatially intermittent in nature and, therefore, not impairing the PCR use of the areas. Therefore, all six partial subsegments previously identified as potentially and/or temporarily impaired for PCR have been removed from the 2018 IR. Additional information regarding assessments related to the Deepwater Horizon oil spill can be found in Part III, Chapter 2.

## Summary of Overall Water Quality in Louisiana

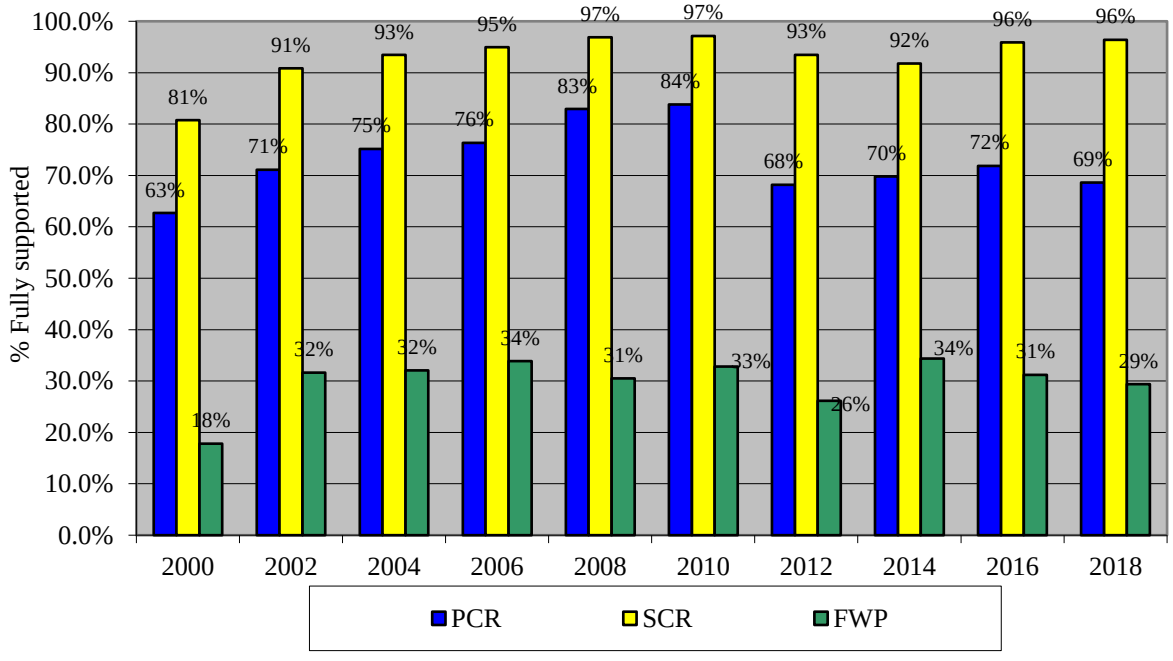
Prior to development of the 2018 IR, LDEQ delineated 21 new subsegments along the Northshore of Lake Pontchartrain (LAC 33:IX.1123. Table 3). The new subsegments were based on ecoregion borders in order to better account for DO and other natural conditions in the water bodies. Ecoregions are areas of similar natural geologic, hydrologic, and floristic conditions. As a result of this addition, many of the summary figures found below for the 2018 IR are higher than those found in the 2016 IR. This does not reflect a decline in water quality for the Northshore area or the state as a whole. Rather, it is simply an artifact of the increased number of subsegments identified in Louisiana's water quality regulations.

For the 2018 IR full support of the designated use of secondary contact recreation (SCR or "boating") remained the same at 96% (Figure 1.1.1). Support of the PCR use ("swimming") decreased from 72% of assessed water body subsegments down to 69%. Of the 69% of subsegments showing impairment of the PCR use, 74% (114 of 154 subsegments) are due to

elevated fecal coliform densities and 11% (17 of 154 subsegments) are due to enterococcus densities. Enterococcus sampling of coastal recreation water bodies is new for the 2018 IR, thus representing a new suspected cause of impairment in the IR assessment process. The remaining 14.9% of PCR impairments are due to chemical contamination (7.8%) or elevated water temperature (7.1%). For SCR use, 81% (17 of 21 subsegments) of the impairments are due to fecal coliforms and 19% (4 of 21 subsegments) are due to chemical contamination of some sort.

Fish and wildlife propagation (FWP) use support decreased slightly from 31% of assessed water body subsegments down to 29%. This is nearly the same as the average use support of 30% between 2000 and 2016. The slight decrease in use support for FWP may be due in part to the creation of 21 new subsegments. The new subsegments are part of the eastern Lower Mississippi River Alluvial Plain (eLMRAP) ecoregion realignment of subsegments. This occurred along the Northshore of Lake Pontchartrain and resulted in assessments of not supporting FWP for most of the new subsegments. Low FWP use support is due in part to the large number of water quality parameters and information used to assess the use. LDEQ currently uses data and information on DO, chlorides, sulfates, total dissolved solids (TDS), turbidity, non-native aquatic plants, pH, oil/tar/grease, seven different metals, and dozens of organic compounds including pesticides when assessing water quality for the designated use. In addition to these monitored parameters, the presence of fish consumption advisories due to mercury or organic chemicals also results in impairment to this designated use.

**Figure 1.1.1**
**Comparison over time of designated use support for three primary designated uses of Primary Contact Recreation (PCR), Secondary Contact Recreation Use (SCR), and Fish and Wildlife Propagation (FWP). 2018 Louisiana Water Quality Integrated Repo**



## Summary of Suspected Causes of Impairment to Water Quality

Table 1.1.2 lists all suspected causes of impairment for all designated uses. All values reported in summary tables and charts are based solely on subsegments found in Louisiana regulations as designated subsegments (LAC 33:IX.1123.Table 3). This is done to assure a stable baseline for cycle-to-cycle summaries, excluding so called "advisory only" subsegments, which can change based on advisory status. These "advisory only" subsegments are established and noted in Appendix A, which includes all assessments, to account for fish consumption or swimming advisories on small portions of a regulatory subsegment. In these cases, the water body defined in the regulation is not impaired; however, a limited portion or tributary may be impaired due to the advisory.

Low DO, which is used to determine support of the FWP use, continues to be the most frequently cited suspected cause of impairment with 201 subsegments affected, up from 188 subsegments in 2016. Fecal coliform ranks second in terms of the number of subsegments impacted (148). This suspected cause of impairment is used to assess the designated uses of PCR and SCR, as well as drinking water supply (DWS) and oyster propagation (OYS). Mercury in fish tissue continues to be third in frequency of impairments with 113 subsegments affected (Table 1.1.2). Turbidity moved to the fourth most frequently cited source of impairment (94 subsegments), while TDS fell to fifth with 73 subsegments affected. Highly turbid waters, as measured by turbidity, can cause problems for aquatic life and aesthetic concern for human recreation.

Nutrient listings, including nitrate/nitrite and total phosphorus, were first reported many years ago based on qualitative evaluative assessments rather than on data analysis. Remaining nutrient listings are closely associated with low DO impairments. The suspected impairment causes of TDS, sulfates, and chlorides are all related to the concentration of certain minerals and other natural or introduced substances in the water.

Finally, chemicals commonly associated with industrial activities are reported infrequently (Table 1.1.2). These include polychlorinated biphenyls (PCBs); 2,3,7,8-tetrachlorodibenzofuran and other furan compounds; lead; 2,3,7,8-tetrachlorodibenzodioxin and other dioxin compounds; 1,2-dichloroethane; benzo(a)pyrene (PAHs); 1,1,1,2-tetrachloroethane; bromoform; hexachlorobenzene; hexachlorobutadiene; phenol; and polycyclic aromatic hydrocarbons (PAHs). LDEQ currently tests for 35 volatile organic compounds (VOCs) on a quarterly basis at all ambient monitoring sites. In addition, four Mississippi River sites are tested monthly for 31 VOCs, 29 PCBs and pesticides, and 54 semi-volatiles and phenols. Between October 1, 2013 and September 12, 2017, 63,207 organic chemical analyses were recorded by LDEQ. Of these, only 325 results, or one-half of one percent of all samples analyzed, resulted in detectable concentrations of the chemical analyzed. The 325 detections resulted in nine human health drinking water supply or human health non-drinking water supply criteria exceedances. This represents only 0.014% of all available chemical sample results. There were no exceedances of aquatic life criteria for organic compounds. Among the nine criteria exceedances, only one subsegment, Grand Bayou (LA100709_00), was reported as impaired for drinking water use. It had two criterion exceedances in the four-year period of record for the 2018 IR. The two criterion failures for LA100709_00 were approximately three months apart. The compound, 1,2-dichloroethane, is an older but commonly used solvent in cleaning products, so it is possible the criterion exceedances were due to accidental releases. LDEQ regional staff and Louisiana Department of Health (LDH) drinking water staff were notified of the impairment. All remaining organic chemical detections were either below

Louisiana water quality criteria, or occurred only once during the last four years. More information on procedures for assessing organic compounds can be found in Part III, Chapter 2.

**Table 1.1.2**

**Number of water body subsegments impacted by each suspected cause of impairment; includes all designated uses. *2018 Louisiana Integrated Report* assessment.**

| Suspected Causes of Impairment | River | Lake | Estuary | Wetland | Total |
|---|---|---|---|---|---|
| Dissolved Oxygen | 165 | 24 | 11 | 1 | 201 |
| Fecal Coliform | 124 | 11 | 12 | 1 | 148 |
| Mercury - Fish Consumption Advisory | 83 | 20 | 9 | 1 | 113 |
| Turbidity | 77 | 17 | | | 94 |
| Total Dissolved Solids (TDS) | 60 | 12 | | 1 | 73 |
| Non-Native Aquatic Plants | 27 | 16 | 1 | | 44 |
| Nitrate/Nitrite (Nitrite + Nitrate As N) | 38 | 4 | | | 42 |
| Phosphorus, Total | 36 | 4 | | | 40 |
| Sulfate | 25 | | | 1 | 26 |
| Chloride | 19 | 1 | | 1 | 21 |
| Enterococcus | 11 | | 6 | | 17 |
| pH, Low | 17 | | | | 17 |
| Color | 9 | 3 | | 1 | 13 |
| Temperature | 9 | 2 | | | 11 |
| PCBs - Fish Consumption Advisory | 3 | 2 | 4 | | 9 |
| Lead | 8 | 1 | | | 9 |
| Dioxin - Fish Consumption Advisory | 3 | | 4 | | 7 |
| Furan Compounds | 3 | | 4 | | 7 |
| pH, High | 1 | 4 | | | 5 |
| Benzo(a)Pyrene (PAHs) | 3 | | | | 3 |
| Cause Unknown | | | | 3 | 3 |
| 1,2-Dichloroethane | 2 | | | | 2 |
| 2,3,7,8-Tetrachlorodibenzofuran | 2 | | | | 2 |
| 2,3,7,8-Tetrachlorodibenzo-p-Dioxin | 2 | | | | 2 |
| Copper | 2 | | | | 2 |
| 1,1,1,2-Tetrachloroethane | 1 | | | | 1 |
| Arsenic | | 1 | | | 1 |
| Atrazine | 1 | | | | 1 |
| Bromoform | 1 | | | | 1 |
| Dioxin | 1 | | | | 1 |
| Hexachlorobenzene | | 1 | | | 1 |
| Hexachlorobutadiene | | 1 | | | 1 |

**Table 1.1.2**

**Number of water body subsegments impacted by each suspected cause of impairment; includes all designated uses. *2018 Louisiana Integrated Report* assessment.**

| Suspected Causes of Impairment | River | Lake | Estuary | Wetland | Total |
|---|---|---|---|---|---|
| Mercury | | 1 | | | 1 |
| Methyl Parathion | 1 | | | | 1 |
| Oil And Grease | | 1 | | | 1 |
| PCBs In Sediment | 1 | | | | 1 |
| Phenol | 1 | | | | 1 |
| Polychlorinated Biphenyls (PCBs) | 1 | | | | 1 |
| Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems) | 1 | | | | 1 |

As noted above, prior to development of the 2018 IR 21 additional subsegments were added to LAC 33:IX.1123.Table 3. This is an unusual occurrence for the regulations because the number of subsegments has remained mostly stable at approximately 478 for a number of years. The additional subsegments resulted in an increase in the raw number of suspected causes of impairment. However, when considered as causes-per-subsegment there was only a slight increase between the two IR cycles. The slight increase was partially due to the inclusion of a new criterion, enterococcus, which accounted for 17 new suspected causes of impairment to coastal recreational waters. Table 1.1.3 provides an indication of how many additional suspected causes of impairments were reported between the 2016 and 2018 IR reporting cycles.

**Table 1.1.3**

**Comparison of the number of suspected causes between the 2016 and 2018 Water Quality Integrated Reports. *2018 Louisiana Integrated Report.***

| 2016 and 2018 Suspected Causes of Impairment | 2016 Total | 2018 Total |
|---|---|---|
| 1,1,1,2-Tetrachloroethane | 1 | 1 |
| 1,2-Dichloroethane | 2 | 2 |
| 2,3,7,8-Tetrachlorodibenzofuran | 2 | 2 |
| 2,3,7,8-Tetrachlorodibenzo-p-Dioxin | 2 | 2 |
| Arsenic | 1 | 1 |
| Atrazine | 1 | 1 |
| Benzo[a]Pyrene (PAHs) | 2 | 3 |
| Bromoform | 1 | 1 |
| Cause Unknown | -- | 3 |
| Chloride | 26 | 21 |
| Color | 9 | 13 |
| Copper | 2 | 2 |
| Dioxin | -- | 1 |
| Dioxin - Fish Consumption Advisory | -- | 7 |

**Table 1.1.3**
**Comparison of the number of suspected causes between the 2016 and 2018 Water Quality Integrated Reports. *2018 Louisiana Integrated Report.***

| 2016 and 2018 Suspected Causes of Impairment | 2016 Total | 2018 Total |
|---|---|---|
| Dissolved Oxygen | 188 | 201 |
| Enterococcus | -- | 17 |
| Fecal Coliform | 129 | 148 |
| Furan Compounds | -- | 7 |
| Hexachlorobenzene | 2 | 1 |
| Hexachlorobutadiene | 2 | 1 |
| Lead | 9 | 9 |
| Mercury | 1 | 1 |
| Mercury - Fish Consumption Advisory | 103 | 113 |
| Methyl Parathion | 1 | 1 |
| Nitrate/Nitrite (Nitrite + Nitrate As N) | 44 | 42 |
| Non-Native Aquatic Plants | 44 | 44 |
| Oil And Grease | 1 | 1 |
| PCBs - Fish Consumption Advisory | -- | 9 |
| PCBs In Sediment | -- | 1 |
| pH, High | 3 | 5 |
| pH, Low | 5 | 17 |
| Phenol | 1 | 1 |
| Phosphorus, Total | 42 | 40 |
| Polychlorinated Biphenyls (PCBs) | 6 | 1 |
| Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems) | 2 | 1 |
| Sulfate | 39 | 26 |
| Temperature | 9 | 11 |
| Total Dissolved Solids (TDS) | 85 | 73 |
| Turbidity | 83 | 94 |
| **Total Number of Reported Suspected Causes** | **848** | **923** |
| **Number of Subsegments for each IR Reporting Cycle** | **478** | **499** |
| **Causes Per Subsegment for each IR Reporting Cycle** | **1.77** | **1.85** |

## Summary of Suspected Sources of Impairment to Water Quality

Table 1.1.4 provides a list of all suspected sources of subsegment impairment across all designated uses. The large number of subsegment listings for *source unknown* and *atmospheric deposition-toxics* is largely due to the high number of mercury-related fish consumption advisories in Louisiana. *Natural sources* were reported for 178 subsegments. This single suspected source was primarily related to low DO, chlorides, sulfates, TDS, and turbidity; however, six other suspected causes also included natural sources as the suspected source. In addition to the 178 subsegments

specifically reported for natural sources, 85 subsegments were reported for other suspected sources of impairment related to natural conditions.

**Table 1.1.4**

**Number of water body subsegments impacted by each suspected source of impairment; includes all designated uses. *2018 Louisiana Integrated Report* assessment.**

| Suspected Source of Impairment | River | Lake | Estuary | Wetland | Total |
|---|---|---|---|---|---|
| Natural Sources | 142 | 23 | 11 | 2 | 178 |
| Source Unknown | 121 | 27 | 14 | 5 | 167 |
| Atmospheric Deposition - Toxics | 83 | 19 | 9 | 1 | 112 |
| On-Site Treatment Systems (Septic Systems And Similar Decentralized Systems) | 85 | 2 | 6 | | 93 |
| Agriculture | 65 | 14 | | | 79 |
| Package Plant Or Other Permitted Small Flows Discharges | 46 | 3 | 2 | | 51 |
| Introduction Of Non-Native Organisms (Accidental Or Intentional) | 27 | 16 | 1 | | 44 |
| Sewage Discharges In Unsewered Areas | 25 | 11 | 2 | | 38 |
| Municipal Point Source Discharges | 30 | 1 | | | 31 |
| Wildlife Other Than Waterfowl | 17 | 1 | 4 | 1 | 23 |
| Industrial Point Source Discharge | 14 | 2 | 4 | | 20 |
| Silviculture Activities | 16 | 3 | | | 19 |
| Drought-Related Impacts | 14 | | | | 14 |
| Waterfowl | 7 | 2 | 4 | 1 | 14 |
| Sanitary Sewer Overflows (Collection System Failures) | 11 | | 2 | | 13 |
| Livestock (Grazing Or Feeding Operations) | 11 | | | | 11 |
| Rural (Residential Areas) | 10 | | | | 10 |
| Site Clearance (Land Development Or Redevelopment) | 9 | 1 | | | 10 |
| Sediment Resuspension (Clean Sediment) | 8 | 1 | | | 9 |
| Marina/Boating Sanitary On-Vessel Discharges | 8 | | | | 8 |
| Runoff From Forest/Grassland/Parkland | 7 | 1 | | | 8 |
| Discharges From Municipal Separate Storm Sewer Systems (MS4) | 5 | 1 | 1 | | 7 |
| Construction Stormwater Discharge (Permitted) | 5 | 1 | | | 6 |
| Naturally Occurring Organic Acids | 6 | | | | 6 |
| Water Diversions | 5 | 1 | | | 6 |
| Upstream Source | 4 | 1 | | | 5 |
| Contaminated Sediments | 3 | 1 | | | 4 |
| Forced Drainage Pumping | 4 | | | | 4 |

**Table 1.1.4**

**Number of water body subsegments impacted by each suspected source of impairment; includes all designated uses. *2018 Louisiana Integrated Report* assessment.**

| Suspected Source of Impairment | River | Lake | Estuary | Wetland | Total |
|---|---|---|---|---|---|
| Natural Conditions - Water Quality Standards Use Attainability Analyses Needed | 2 | | 2 | | 4 |
| Residential Districts | 4 | | | | 4 |
| Silviculture Harvesting | 3 | 1 | | | 4 |
| Sources Outside State Jurisdiction Or Borders | 4 | | | | 4 |
| CERCLA NPL (Superfund) Sites | 3 | | | | 3 |
| Crop Production (Non-Irrigated) | 3 | | | | 3 |
| Industrial/Commercial Site Stormwater Discharge (Permitted) | 1 | 2 | | | 3 |
| Municipal (Urbanized High Density Area) | 3 | | | | 3 |
| Wetland Drainage | 2 | 1 | | | 3 |
| Construction | 2 | | | | 2 |
| Crop Production (Irrigated) | 2 | | | | 2 |
| Erosion And Sedimentation | 2 | | | | 2 |
| Impacts From Hydrostructure Flow Regulation/Modification | 2 | | | | 2 |
| Manure Runoff | 2 | | | | 2 |
| Non-Point Source | 1 | | 1 | | 2 |
| Petroleum/Natural Gas Activities | 2 | | | | 2 |
| Animal Feeding Operations (NPS) | 1 | | | | 1 |
| Changes In Tidal Circulation/Flushing | 1 | | | | 1 |
| Confined Animal Feeding Operations (NPS) | | 1 | | | 1 |
| Dredging (E.G., For Navigation Channels) | 1 | | | | 1 |
| Highways, Roads, Bridges, Infrastructure (New Construction) | 1 | | | | 1 |
| Managed Pasture Grazing | 1 | | | | 1 |
| Marina/Boating Pumpout Releases | | | 1 | | 1 |
| Pesticide Application | | 1 | | | 1 |
| Petroleum/Natural Gas Production Activities (Permitted) | 1 | | | | 1 |
| Sand/Gravel/Rock Mining Or Quarries | 1 | | | | 1 |
| Seafood Processing Operations | 1 | | | | 1 |
| Shallow Lake/Reservoir | | 1 | | | 1 |
| Transfer Of Water From An Outside Watershed | 1 | | | | 1 |
| Unrestricted Cattle Access | 1 | | | | 1 |
| Unspecified Land Disturbance | | 1 | | | 1 |

**Table 1.1.4**

**Number of water body subsegments impacted by each suspected source of impairment; includes all designated uses. *2018 Louisiana Integrated Report* assessment.**

| Suspected Source of Impairment | River | Lake | Estuary | Wetland | Total |
|---|---|---|---|---|---|
| Wet Weather Discharges (NPS) | | | 1 | | 1 |

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
NPL – National Priorities List
NPS – Nonpoint Source

The high number of low DO impairments reported in Table 1.1.2 was due in part to natural conditions but may also be related to high biochemical oxygen demand (BOD) loading of material that lead to the reduction of oxygen levels in the water. These materials come from a variety of sources including sewage, fertilizers, some sediments, and naturally high levels of plant material in swampy areas.

Twenty-five different categories were reported as suspected sources of subsegment impairment by fecal coliform. In rank order they include: on-site treatment systems (septic systems) (60 subsegments); package plant or other permitted small flows discharges (32); natural sources (30); sewage discharges in unsewered areas (29); municipal point source discharges (19); wildlife other than waterfowl (17); waterfowl (11); source unknown (10); livestock (grazing or feeding operations) (9); marina/boating sanitary on-vessel discharges (8); rural (residential areas) (8); runoff from forest/grassland/parkland (7); drought-related impacts (6); sanitary sewage overflows (6); discharges from municipal separate storm sewer systems (MS4) (3); agriculture (2); manure runoff (2); animal feeding operations (NPS) (1); confined animal feeding operations (NPS) (1); industrial point source discharge (1); managed pasture grazing (1); marina/boating pumpout releases (1); nonpoint source (1); unrestricted cattle access (1); and upstream source (1). Twelve of the 25 sources identified above are or could be related to nonpoint sources of pollution; highlighting the impact NPS can have on water quality.

Mercury in Louisiana water bodies is largely derived from atmospheric deposition derived from natural sources or coal-fired power plants, as opposed to direct discharges to water from land based facilities. Pirrone et al. (2010) estimated that global natural sources are responsible for 5,207 Mg (Mg = 1,000 kg or 1 metric ton) of mercury released to the atmosphere annually. Roughly half of this naturally released mercury derives from ocean emissions, with the remainder coming primarily from (1) lakes, soil and plant emissions; (2) biomass burning; and (3) volcanoes and geothermal areas. An estimated 2,320 Mg of mercury is emitted directly from anthropogenic sources. Of this total, approximately 810 Mg (35%) is from coal and oil combustion. Artisanal gold mining accounts for 400 Mg (17%), while 310 Mg (13.4%) is from non-ferrous metal production. The eight remaining individual sources of mercury collectively account for approximately 35% of total anthropogenic sources (Pirrone et al. 2010). Based on the preceding estimates, approximately 69% of all annual worldwide mercury emissions to the atmosphere are derived from natural sources. Taking this into account, the primary sources of mercury in Louisiana waters are most likely national or international in origin and, therefore, largely outside the scope of LDEQ control. More information on mercury in Louisiana can be found at: http://deq.louisiana.gov/page/mercury-initiative.

High turbidity, the fourth most frequently cited cause of impairment (Table 1.1.2) may be caused by poor farming and forestry practices, as well as runoff from construction sites. It can also be naturally occurring in some areas. Chlorides, sulfates, and TDS (collectively referred to as "minerals") are also frequently cited as suspected causes of FWP impairment. Many cases of reported minerals criteria failures may be due to saltwater intrusion in coastal areas. Saltwater from the Gulf of Mexico has naturally higher concentrations of these substances than the freshwater flowing into coastal areas. Water quality criteria for these substances were in some areas originally based on more freshwater conditions; therefore, as coastal areas erode and saltwater intrudes, areas with normally fresher water are now experiencing more brackish (salty) conditions. This may result in more minerals criteria exceedances.

Considering all suspected sources, a large percentage are related to what is collectively known as nonpoint source pollution. NPS pollution is caused by the runoff of stormwater from land such as agricultural fields, forestry areas, construction sites, and urban or suburban areas. In contrast, point sources (PS) of water pollution are those from a discrete pipe such as a small or large industrial discharger or municipal sewage treatment plant. With this distinction in mind, a large percentage of Louisiana subsegments, 205 (41.1%), are impacted by NPS related sources (see Table 1.1.4). A total of 109 (21.8%) subsegments were possibly impacted by point source discharges. Forty-four subsegments were suspected to be impaired by sources related to aquatic invasive species, while a variety of naturally occurring conditions accounted for 206 suspected subsegment impairments. Each subsegment may be impaired by multiple sources including NPS, PS, natural, and/or a variety of other types of sources. Part II, Chapter 2 provides more information on NPS pollution and Louisiana's efforts to control it.

Although Louisiana has a large industry sector, only 30 subsegments out of 499 have reported suspected sources of impairment related to industrial activities. Many of these suspected industrial sources are the result of legacy pollutants which have been or are in the process of being remediated (Part III, Chapter 2 Integrated Report Category 4b Documentation). While industrial activities are certainly a factor impacting Louisiana's water quality, assessments indicate it is not as prevalent as is frequently believed by the public. This is due in large part to stringent CWA and Louisiana Environmental Quality Act (LEQA) (LEQA 1995) permitting and enforcement directed at point source dischargers to Louisiana's water bodies. Part II, Chapter 2 contains more information on water quality permitting and enforcement in Louisiana.

## Summary of River Quality in Louisiana

Figures 1.1.2 through 1.1.4 summarize support of the three most common designated uses for Louisiana rivers. The uses are PCR, SCR, and FWP. Each subsegment may have more than one designated use. Other uses are established for selected water bodies in Louisiana. The status of these uses can be found in Part III, Chapter 3. Summary tables for the suspected causes and sources of impairment to Louisiana's rivers can also be found in Part III, Chapter 3. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

**Figure 1.1.2.**
Support for primary contact recreation (swimming) for Louisiana rivers, 2018 Integrated Report assessment. (Based on 354 assessed rivers)

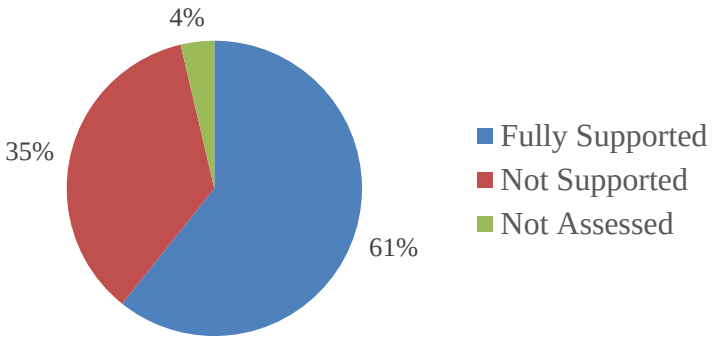



**Figure 1.1.3.**
Support for secondary contact recreation (boating) for Louisiana rivers, 2018 Integrated Report assessment. (Based on 366 assessed rivers)

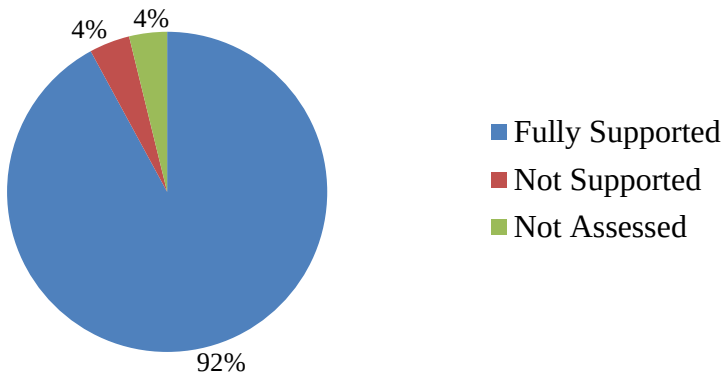
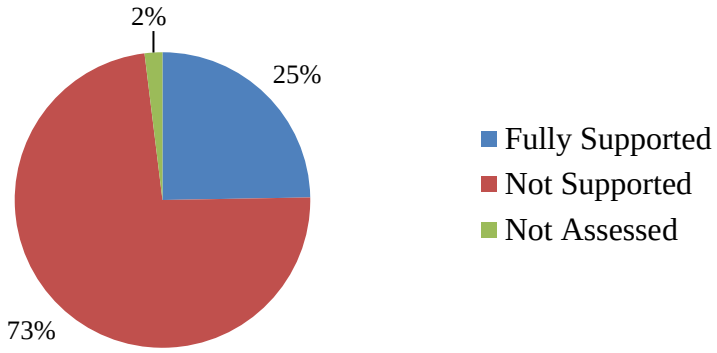


**Figure 1.1.4.**
Support for fish and wildlife propagation (fishing) for Louisiana rivers, 2018 Integrated Report assessment. (Based on 360 assessed rivers)




## Summary of Lake Quality in Louisiana

Figures 1.1.5 through 1.1.7 summarize support of PCR, SCR, and FWP in Louisiana lakes. Other uses are established for selected water bodies in Louisiana, and each water body subsegment may have more than one designated use. The status of these other uses can be found in Part III, Chapter 4. Summary tables for the suspected causes and sources of impairment to Louisiana's lakes can also be found in Part III, Chapter 4. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

**Figure 1.1.5.**
Support for primary contact recreation (swimming) for Louisiana lakes, 2018 Integrated Report assessment. (Based on 65 assessed lakes)

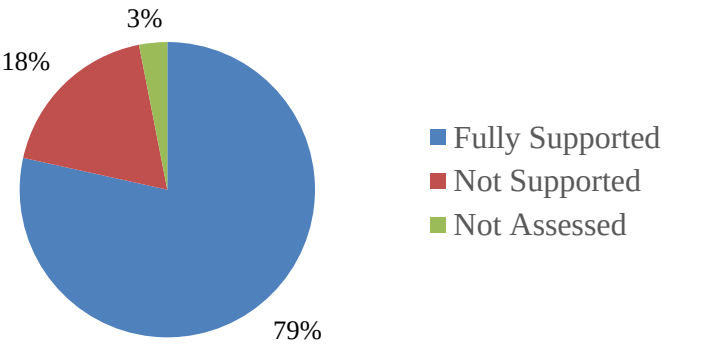


**Figure 1.1.6.**
Support for secondary contact recreation (boating) for Louisiana lakes, 2018 Integrated Report assessment. (Based on 65 assessed lakes)

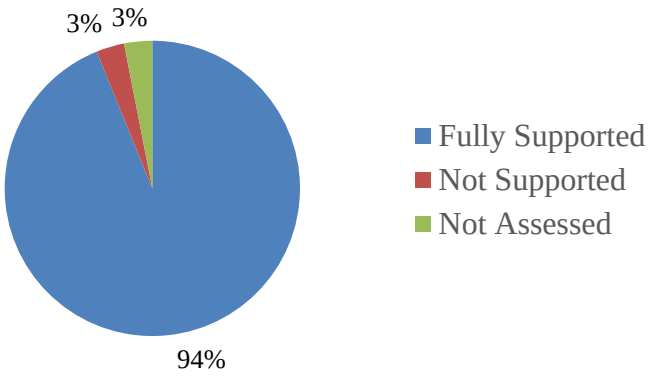
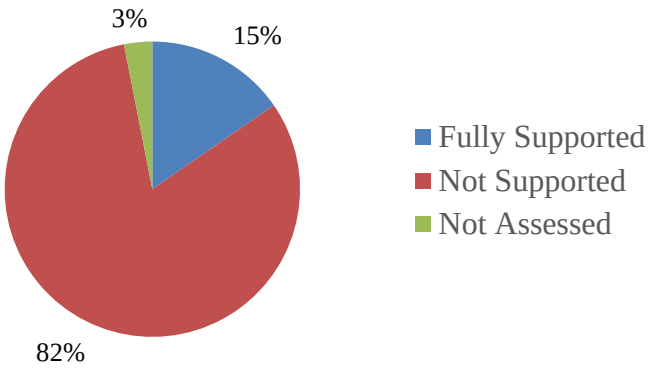



**Figure 1.1.7.**
Support for fish and wildlife propagation (fishing) for Louisiana lakes, 2018 Integrated Report assessment. (Based on 65 assessed lakes)




## Summary of Estuary Quality in Louisiana

Figures 1.1.8 through 1.1.10 summarize support of PCR, SCR, and FWP for Louisiana estuaries. Other uses are established for selected water bodies in Louisiana, and each water body subsegment may have more than one designated use. The status of these uses can be found in Part III, Chapter 5. Summary tables for the suspected causes and sources of impairment to Louisiana's estuaries can also be found in Part III, Chapter 5. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

**Figure 1.1.8.**
Support for primary contact recreation (swimming) for Louisiana estuaries, 2018 Integrated Report assessment. (Based on 52 assessed estuaries)

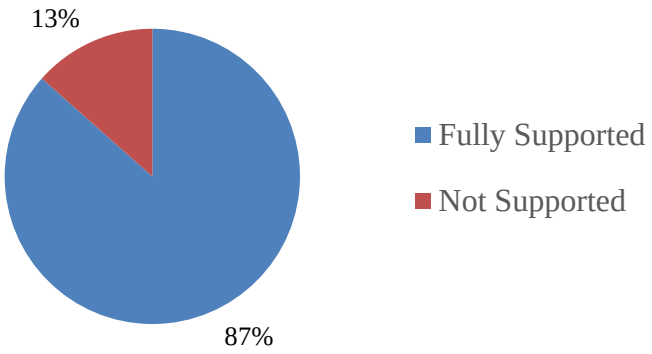



**Figure 1.1.9.**
Support for secondary contact recreation (boating) for Louisiana estuaries, 2018 Integrated Report assessment. (Based on 52 assessed estuaries)

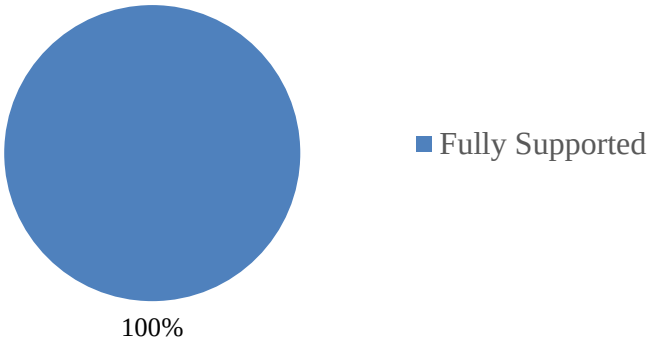
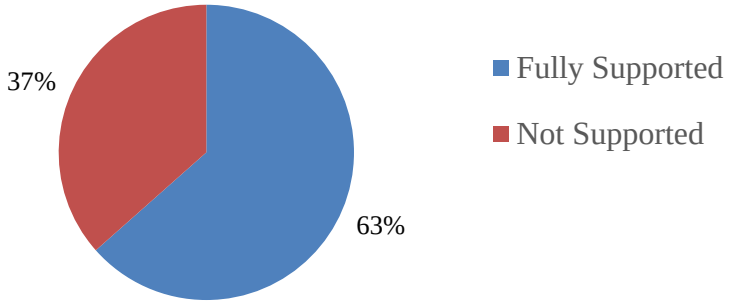


**Figure 1.1.10.**
Support for fish and wildlife propagation (fishing) for Louisiana estuaries, 2018 Integrated Report assessment. (Based on 52 assessed estuaries)




## Summary of Wetland Quality in Louisiana

Figures 1.1.11 through 1.1.13 summarize support of PCR, SCR, and FWP in Louisiana wetlands. Other uses are established for selected water bodies in Louisiana, and each water body subsegment may have more than one designated use. The status of these uses can be found in Part III, Chapter 6. Summary tables for the suspected causes and sources of impairment to Louisiana's wetlands can also be found in Part III, Chapter 6. Water quality assessments for all subsegments in Louisiana can be found in Appendix A.

**Figure 1.1.11.**
Support for primary contact recreation (swimming) for Louisiana wetlands, 2018 Integrated Report assessment. (Based on 6 assessed wetlands)

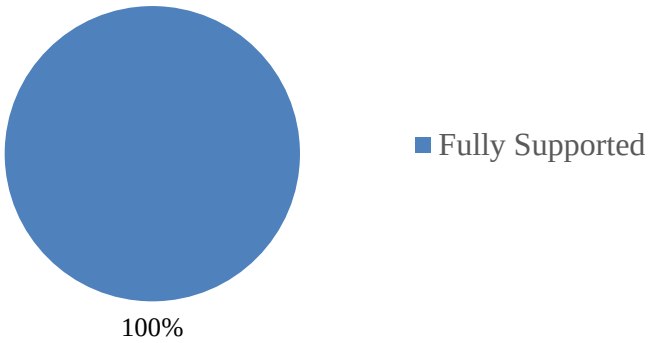


**Figure 1.1.12.**
Support for secondary contact recreation (boating) for Louisiana wetlands, 2018 Integrated Report assessment. (Based on 16 assessed wetlands)

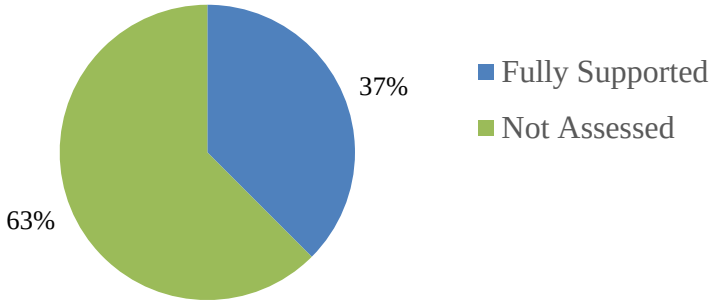
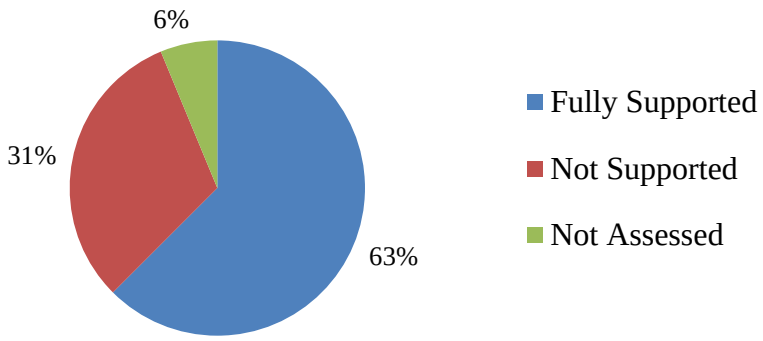



Figure 1.1.13.
Support for fish and wildlife propagation (fishing) for Louisiana wetlands, 2018 Integrated Report assessment. (Based on 16 assessed wetlands)




## Surface Water Pollution Control Programs

LDEQ has the responsibility of managing the quality of Louisiana's surface waters by implementing pollution control measures and protecting the integrity of those waters where good quality exists. Water pollution controls employed by the agency include establishing water quality standards, conducting intensive surveys, developing TMDLs, writing municipal and industrial wastewater discharge permits, inspecting facilities, responding to complaints and incidents, enforcing permit requirements, reviewing and certifying projects affecting water quality, promoting use of best management practices (BMPs) for NPS pollution, and regular water quality monitoring and assessment of the state's surface waters. More information on LDEQ's surface water pollution control programs can be found in Part II, Chapter 2.

## Groundwater Quality in Louisiana

The LDEQ, WPAD, Aquifer Sampling and Assessment (ASSET) Program is an ambient groundwater monitoring program designed to determine and monitor the quality of groundwater produced from Louisiana's major freshwater aquifers, and provides water quality data on these aquifers. Through this program samples are collected from approximately 200 water wells located in 14 aquifers across the state. The sampling process is designed so that all 14 aquifers are monitored on a rotating basis, within a three-year period, so that each well is monitored every three years.

The USEPA has encouraged states to select an aquifer or hydrogeologic setting and discuss available data that best reflects the quality of the resource. Data presented for this report is from ASSET Program monitoring data collected in calendar year 2016 from the Catahoula, Red River Alluvial, and North Louisiana Terrace aquifers. Details regarding these aquifers can be found in Part IV of this report.

# PART II: BACKGROUND

## Chapter 1: Louisiana Resources

### Louisiana Geography and Climate

Louisiana lies entirely in the Gulf Coastal Plain physiographic province and can be divided into five natural physiographic regions: Coastal Marsh, Mississippi Alluvial Valley, Red River Valley, Terraces, and Hills. The state has 12 major watershed basins, which are described in Appendix A and shown in Figure 2.1.1. Maximum elevations in Louisiana are located in the hills of the northwest, where the state's oldest geologic formations are found. The highest elevation in the state is only 535 feet. The lowest elevations in the state are found in the Coastal Marsh area, which extends across the southern portion of Louisiana and represents a valuable fisheries and wildlife resource. Due to levee construction, marsh filling, and subsidence, portions of south Louisiana are below sea level. Because Louisiana's coastal resources differ significantly in physical, chemical, and hydrological characteristics from inland resources, the atlas information provided below for lakes and wetlands has been broken down into two categories: inland and coastal (Table 2.1.1). Those categorized as coastal receive some tidal influx, even though some of the coastal lakes and wetlands are characterized by freshwater vegetation.

Louisiana has a humid subtropical climate influenced by the extensive landmass to the north, the Gulf of Mexico to the south, and the subtropical latitude. Prevalent winds from the south/southeast bring in warm, moist air from the Gulf, resulting in abundant rainfall. The statewide annual average precipitation varies from 48 inches in the northwestern part of the state near Shreveport to 64 inches in the southeastern coastal plains near Thibodaux.

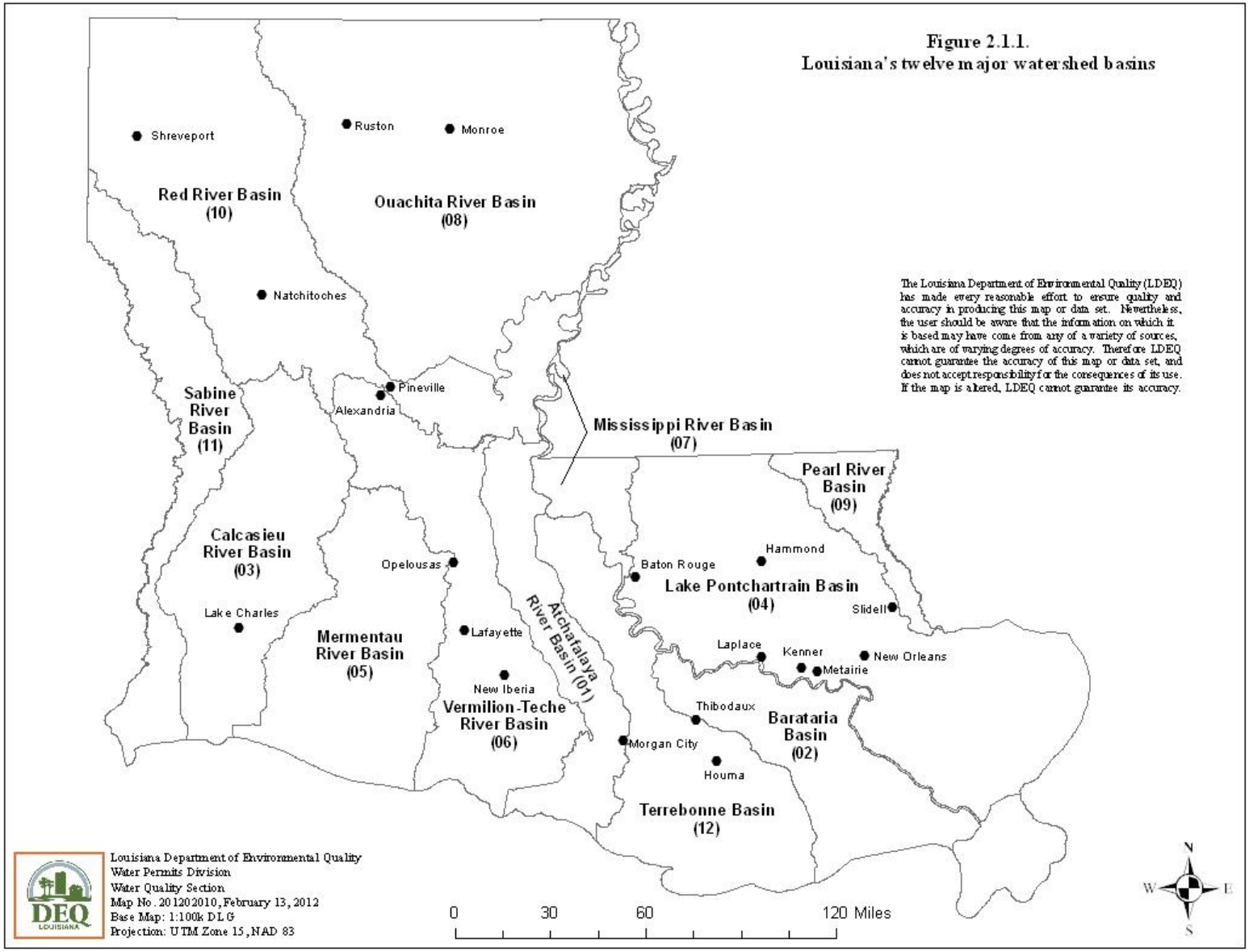


Figure 2.1.1.
Louisiana's twelve major watershed basins
Shreveport
Ruston
Monroe
Red River Basin
(10)
Ouachita River Basin
(08)
Natchitoches
Sabine
River
Basin
(11)
Pineville
Alexandria
Mississippi River Basin
(07)
Pearl River
Basin
(09)
Calcasieu
River Basin
(03)
Opelousas
Baton Rouge
Hammond
Lake Pontchartrain Basin
(04)
Slidell
Lake Charles
Mermentau
River Basin
(05)
Lafayette
Atchafalaya
River Basin (01)
Laplace
Kenner
New Orleans
Metairie
New Iberia
Vermilion-Teche
River Basin
(06)
Thibodaux
Barataria
Basin
(02)
Morgan City
Houma
Terrebonne Basin
(12)
The Louisiana Department of Environmental Quality (LDEQ) has made every reasonable effort to ensure quality and accuracy in producing this map or data set. Nevertheless, the user should be aware that the information on which it is based may have come from any of a variety of sources, which are of varying degrees of accuracy. Therefore LDEQ cannot guarantee the accuracy of this map or data set, and does not accept responsibility for the consequences of its use. If the map is altered, LDEQ cannot guarantee its accuracy.
Louisiana Department of Environmental Quality
Water Permits Division
Water Quality Section
Map No. 20120201O, February 13, 2012
Base Map: 1:100k DLG
Projection: UTM Zone 15, NAD 83
0
30
60
120 Miles
N
W
E
S

**Table 2.1.1**

**Geophysical data for Louisiana.**

| | |
|---|---|
| State Population (2016 population estimate[1] ) | 4,681,666 |
| State Surface Area (Land)[2] (square miles) | 43,204 |
| Percent Land | 82.5% |
| State Surface Area (Water)[2] (square miles) | 9,174 |
| Percent Water | 17.5% |
| Major River Basins | 12 |
| **Rivers: (miles)** | |
| Total River Miles | 66,294 |
| Perennial | 32,955 |
| Intermittent | 20,667 |
| Ditches/Canals | 12,672 |
| **Border Miles: (miles)** | |
| Names and Mileage of Border Rivers | |
| Total Mileage | 484 |
| Pearl River | 74 |
| Mississippi River | 200 |
| Sabine River (includes Toledo Bend Reservoir) | 210 |
| **Lakes:** | |
| Total Number of Fresh Water Lakes/Reservoirs | 6,603 |
| Total Acres of Fresh Water Lakes/Reservoirs | 1,078,031 |
| Number of Inland Fresh Water Lakes/Reservoirs > 1 sq. mi. | 62 |
| Acres of Inland Fresh Water Lakes/Reservoirs > 1 sq. mi. | 474,506 |
| Number of Coastal Fresh Water Lakes/Reservoirs | 39 |
| Acres of Coastal Fresh Water Lakes/Reservoirs | 239,213 |
| **Wetlands: (acres)** | |
| Fresh Water Inland Wetlands | 3,000,130 |
| Coastal Wetlands [3] | 4,089,393 |
| Swamp | 464,805 |
| Fresh Marsh | 956,617 |
| Intermediate Marsh | 940,592 |
| Brackish Marsh | 997,437 |
| Salt Marsh | 729,942 |

**Table 2.1.1**

**Geophysical data for Louisiana.**

| | |
|---|---|
| **Estuaries/Bays: (square miles)** | 7,656 |
| Coastal Miles[4]: | 397 |
| Total Miles of Shoreline[5]: (includes islands, bays, rivers and bayous up to head of tide water) | 7,721 |

[1] U.S. Census Bureau. Population Division. Table 1. Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2016 (NST-EST2016-01). Release December 2016. At https://www2.census.gov/programs-surveys/popest/tables/2010-2016/state/totals/.

[2] U.S. Census Bureau. State Area Measurements and Internal Point Coordinates. January 1, 2010. At https://www.census.gov/geo/reference/state-area.html.

[3] Sasser, C. E., Visser, J.M., Mouton, E., Linscombe J., Hartley, S.B., 2014. Vegetation types in coastal Louisiana in 2013: U.S. Geological Survey Scientific Investigations Map 3290, 1 sheet, scale 1:550,000. At https://pubs.usgs.gov/sim/3290/.

[4] National Oceanic and Atmospheric Administration (NOAA). 1975. The Coastline of the United States. http://shoreline.noaa.gov/_pdf/Coastline_of_the_US_1975.pdf.

[5] NOAA: Office for Coastal Management. March 3, 2017. Shoreline Mileage of the United States. At https://coast.noaa.gov/states/louisiana.html and https://coast.noaa.gov/data/docs/states/shorelines.pdf.

# Chapter 2: Water Pollution Control Program

## Watershed Approach

LDEQ reports on water quality in the state by basin subsegment. Subsegments are smaller watersheds or portions of watersheds within the 12 larger basins of the state. Louisiana is divided into 12 major watershed basins (Figure 2.1.1), and each basin is further divided into water body subsegments. This subsegment approach divides the state's waters into discrete hydrologic units. The plan for this approach was presented in the 1978 Water Quality Management Plan and underwent a major revision in 1985 to increase hydrologic consistency within each named subsegment. The final draft of the Louisiana Basin and Subsegment Boundaries plan was completed in 1990 and is reviewed periodically to ensure that subsegments are distinct and consistent representations of the state's hydrology. The current version, Volume 4, was completed in November 2014. The water body subsegment system within each watershed basin provides a workable framework for evaluation of the state's waters. Subsegments are periodically added or removed as water quality standards related to a subsegment or group of subsegments are revised. Adding or removing subsegments requires detailed analysis and justification prior to revision in LAC 33:IX.1123.

## Water Quality Standards Program

Louisiana's water quality standards are the foundation of LDEQ's water quality management and pollution control programs. Water quality standards are based on national goals outlined in the CWA (formally referred to as the 1972 Federal Water Pollution Control Act), Sections 101 and 102, and are authorized by § 303 of the CWA and subsequent amendments, the Louisiana Water Control Law (Title 30, Chapter 4 of Louisiana's revised statutes), and the supporting federal regulations found in Title 40, Part 131 of the Code of Federal Regulations (40 CFR 131). Louisiana's water quality standards are adopted as state regulations applicable to surface waters of the state and are contained in Title 33 of the LAC, Part IX, Chapter 11 (LAC 33:IX.1101 et seq., as amended). The water quality standards provide the basis for implementing the state's CWA programs, including water quality assessments and TMDL determinations outlined in the CWA, Sections 303(d) and 305(b), water discharge permitting conducted in conformance with Section 402, NPS pollution management strategies conducted under § 319, and certification of federal activities in state waters as outlined in § 401.

The minimum federal regulatory requirements for state water quality standards (40 CFR 131.6) are: (1) the designation of uses consistent with the CWA; (2) the methods and analyses used to revise standards; (3) criteria sufficient to support the designated uses; (4) an antidegradation policy; (5) certification by the appropriate state legal authority that water quality standards revisions are adopted in accordance with state law; and (6) general information concerning the acceptability of the scientific basis for standards and policies not covered under the CWA (e.g., variances).

### Designated Uses and Water Quality Criteria

Section 101 of the CWA outlines a national goal of water quality that provides for the protection and propagation of fish, shellfish, and wildlife, provides for recreation in and on the water, and prohibits the discharge of toxic pollutants in toxic amounts. Section 102 of the CWA further

outlines that water quality protection programs consider the use of waters for public water supply, agricultural, industrial, and other purposes, including navigation. These goals are also outlined in the federal regulations (40 CFR 131.2).

To achieve the national goals, all Louisiana water bodies were originally assigned or designated uses consistent with CWA mandates that were applied statewide. Criteria to support these designated uses were also assigned statewide in response to federal regulations promulgated to achieve CWA goals. The designated uses adopted for Louisiana's surface waters are: primary contact recreation; secondary contact recreation; fish and wildlife propagation (including a subcategory for limited aquatic life and wildlife); drinking water supply; oyster propagation; agriculture; and outstanding natural resource waters (LAC 33:IX.1111.A).

These uses, along with the total size for each use and water body type combination are shown in Table 2.2.1. Designated uses are established in LAC 33:IX.1123 et seq. The sizes found in Table 2.2.1 are not reflective of the total size for water bodies listed in the Table 2.1.1, above. Rather, these sizes are only for the named water bodies listed as "subsegments" in LAC 33:IX.1123 et seq. Subsegments are watersheds or portions of watersheds delineated as management units for water quality standards, monitoring, assessment, modeling, permitting, surveying, and enforcement purposes.

**Table 2.2.1**

**Total sizes of Louisiana water bodies classified for various designated uses (Louisiana Environmental Regulatory Code 33:IX.1123).**

| Classified Uses | Water Body Type | | | |
|---|---|---|---|---|
| | Rivers (miles)[1] | Lakes (acres)[1] | Estuaries (sq. miles)[1] | Wetlands (acres)[1] |
| Primary Contact Recreation | 9,376.2 | 601,124.3 | 5,732.5 | 1,024,573.5 |
| Secondary Contact Recreation | 9,545.8 | 601,124.3 | 5,732.5 | 1,076,346.5 |
| Fish and Wildlife Propagation | 9,519.8 | 605, 697.3 | 5,732.5 | 1,076,346.5 |
| Drinking Water Supply | 1,040.3 | 246,362.8 | -0- | 464,000.0 |
| Outstanding Natural Resource Waters | 1,710.5 | 28.9 | -0- | -0- |
| Oyster Propagation | 587.2 | -0- | 5,008.8 | 72,320.0 |
| Agriculture | 2,052.3 | 377,416.9 | -0- | -0- |
| Limited Aquatic Life and Wildlife Use | 94.2 | -0- | -0- | -0- |

1. Total water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

Water quality criteria are elements of state water quality standards expressed as constituent concentrations, levels, or narrative statements representing the quality of water protective of the designated use(s). Louisiana adopted general (narrative) and numeric criteria to protect the designated uses of state waters (LAC 33:IX.1113). General criteria are expressed in a narrative form and include descriptions for aesthetics, color, suspended solids, taste and odor, toxic

substances, oil and grease, foam, nutrients, turbidity, flow, radioactive materials, and biological and aquatic community integrity. Numeric criteria are generally expressed as concentrations (e.g., weight measured per liter) or scientific units and include pH, chlorides, sulfates, total dissolved solids, dissolved oxygen, temperature, bacteria, and specific toxic substances. USEPA published guidance or national criteria recommendations for a number of substances, and a state may incorporate these without modification into its water quality standards.

Human health criteria provide guidelines that specify the potential risk of adverse effects to humans due to substances in the water. Factors considered include body weight, risk level, fish consumption, drinking water intake, and incidental ingestion while swimming. Categories of criteria are then developed for each toxic substance for drinking water supplies and non-drinking water. Primary and secondary contact recreation exposures are protected under both drinking water supplies and non-drinking water criteria.

Aquatic life criteria are designed to protect fish and wildlife propagation use, including plants and animals. There are two types of criteria: "acute" for short-term exposure, and "chronic" for long-term exposure. Separate criteria are also developed for fresh and salt waters. Listings of specific toxic criteria for protection of human health and aquatic life for Louisiana are found in LAC 33:IX.1113.C.6.Table 1.

The development of national aquatic life and human health criteria is a dynamic process that takes into consideration the most recent and best defensible, scientific information available. Since the establishment of designated uses and criteria based on national goals, state and federal agencies have recognized the need to establish site-specific or regional standards that may account for a state's unique water quality. A state may make a determination on whether the designated uses are attainable. A designated use that is not an existing use may be removed if it is demonstrated through a Use Attainability Analysis (UAA) that the designated use is not feasible due to one or more of the following reasons (LAC 33:IX.1109.B.3):

1. Naturally occurring pollutant concentrations prevent the attainment of the use;
2. Natural, ephemeral, intermittent, or low flow conditions prevent the attainment of the use;
3. Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;
4. Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the original conditions;
5. Physical conditions related to the natural features of the water body (e.g., proper substrate) preclude attainment of aquatic life use protection; and
6. Controls more stringent than those required by §301(b) or §306 of the CWA would result in substantial and widespread economic and social impact.

According to the regulations, a UAA is defined as "a structured scientific assessment of the factors (chemical, physical, biological, and economic) affecting the attainment of designated water uses in a water body." (see also LAC 33:IX.1105 and 40 CFR 131.3(g)). The UAA process entails the methodical collection of data that is scientifically analyzed, summarized, and used to make recommendations for site-specific uses, and the criteria to support the uses. Acceptable methods

used in conducting the UAA process are described in USEPA guidance documents. Several water bodies in Louisiana have site-specific criteria and uses based on UAAs developed in coordination with USEPA (see endnotes in LAC 33.IX.1123.Table 3).

Additionally, a state may determine that, while all original designated uses may be supported, the water quality criteria adopted to protect those uses may not be appropriate. In such instances, a state may compile technical documentation to justify a criteria refinement while not conducting a comprehensive UAA. A state is allowed the flexibility to develop, adopt and implement state-specific criteria provided there is sufficient justification and technical documentation to support the criteria refinements.

Technical support documentation and/or UAAs for site-specific criteria and/or uses may be developed for a specific water body, water body type (e.g., wetlands), ecological region (ecoregion), or watershed. LDEQ recently used an ecoregion and "least-impacted" reference water body approach to establish water quality criteria within an ecoregion. Ecoregions are management units which are spatially grouped ecological regions with similar physical, chemical, and biological characteristics.

## Nutrient Standards Development

Louisiana continues to work with USEPA to collect information that will inform nutrient criteria development and implementation. USEPA recognizes that "one size fits all" nutrient criteria are not appropriate and recommends that each state's nutrient criteria be water body-specific (e.g., lakes, rivers and streams, estuaries, etc.) and applicable within an appropriate ecoregional framework.

USEPA published a series of guidance documents that outlined approaches to setting nutrient criteria; the approaches included deriving criteria based on an ecoregion-water body type approach or using stressor-response studies to derive protective levels. In November 2001, USEPA issued guidance in the form of a memorandum that clarified the flexibility that states have in development of defensible nutrient criteria. USEPA is also supportive of using translators for states narrative nutrient criteria.

In May 2016, the department completed the report, *Detecting Nutrient Thresholds for Aquatic Life in Louisiana Inland Rivers and Streams*. LDEQ collected habitat, water quality (including nutrients), macroinvertebrate, fish, and algal data along a gradient of nutrient impacts from 60 sites within the South Central Plains Flatwoods (SCPF), South Central Plains Southern Tertiary Uplands (SCPSTU), South Central Plains Tertiary Uplands (SCPTU), Terrace Uplands (TU), and the Upper Mississippi River Alluvial Plains (UMRAP) Ecoregions. A piecewise regression model was used to evaluate stressor-response relationships for total nitrogen (TN) and total phosphorus (TP) as stressors with water quality and biological response metrics to determine if change points or thresholds for TN and TP could be detected. Approximately 3,600 biological metrics were calculated and the analyses used resulted in 141 total thresholds detected within the five inland ecoregions.

LDEQ is working to use the findings from this threshold report in combination with the Ambient Water Quality Monitoring Network (AWQMN) and reference site data to develop scientifically defensible nutrient translators for assessment of nutrient impairment in Louisiana inland rivers and streams. A Quality Assurance Project Plan (QAPP) is currently in development for determination of nutrient translators in inland rivers and streams. The QAPP will detail methods to use results

from the threshold report to develop a decision tree for assessment of nutrient impairment in Inland Rivers and Streams.

LDEQ also continues to inform and seek input from stakeholders about nutrient management for Louisiana's water bodies through implementation of the state's multi-agency Louisiana Nutrient Management Strategy. LDEQ is currently an active member on USEPA's Hypoxia Task Force and participates in Gulf of Mexico Alliance activities.

## Ecoregional Dissolved Oxygen Standards Refinement

Appropriate levels of oxygen in water bodies are necessary for the respiration of aquatic life. Although a primary constituent of water, the oxygen contained in a water molecule is unavailable to biota due to chemical bonding; it must be present in its dissolved atmospheric form ($O_2$) to be of use. The amount of DO that is needed can vary among organisms, their associated habitats, ecosystems, and regions. The concentration of DO present in a water body depends on atmospheric and photosynthetic inputs, metabolism of aquatic biota, physical processes, and environmental variables.

When adopting or revising water quality criteria to establish or reflect site-specific conditions, a determination of attainable uses and criteria for a specific water body may be based on comparisons made between the water body of interest and a "least-impacted" control or "reference" water body, or on the basis of background conditions of reference water bodies. Because of the similarity and homogeneity of ecological characteristics such as climate, land use, soil type, land surface form, flora, fauna and hydromodification within an ecoregion, watersheds may be managed on an ecoregional level. Specifically, the ecoregion-based approach may be used to develop regional or even site-specific water quality criteria, management strategies, and implementation plans for water resources.

With the support of USEPA, LDEQ has used least-impacted reference sites and an ecoregional approach to refine appropriate DO criteria on a more regional basis in Louisiana. Criteria for the different water body types (e.g., streams, lakes, bays, canals, etc.) will be established while accounting for the natural characteristics of Louisiana's ecoregions.

In 2009, LDEQ adopted revised DO criteria on an ecoregional basis for several water body types throughout the Barataria and Terrebonne Basins (LDEQ 2008). This DO criteria refinement resulted from the *Use Attainability Analysis of Barataria and Terrebonne Basins for Revision of Dissolved Oxygen Water Quality Criteria*, commonly referred to as the BT UAA.

In 2015, LDEQ continued the effort to refine DO criteria on an ecoregional basis with the *Use Attainability Analysis of Inland Rivers and Streams in the Eastern Lower Mississippi River Alluvial Plains Ecoregion for Review of Dissolved Oxygen Water Quality Criteria* (i.e., the eastern LMRAP UAA). The eastern LMRAP Ecoregion study re-evaluated the DO criteria and the critical period in the eastern portion of the LMRAP Ecoregion (on the eastern side of the Mississippi River) by using a qualitative and quantitative ecological comparison with the western portion of the ecoregion in which DO criteria and critical period refinements had already been well established through the BT UAA, which covers the area of the LMRAP Ecoregion on the western side of the Mississippi River. In December 2015, based on the findings presented in the eastern LMRAP UAA, the DO criteria was revised in 31 subsegments in the eastern LMRAP Ecoregion. Similar to the BT UAA, the DO criteria for those 31 subsegments in the eastern LMRAP Ecoregion is 2.3 mg/L DO from March through November and 5.0 mg/L DO from December through February.

Water quality assessments based on the more recent eastern LMRAP Ecoregion DO criteria were incorporated in the 2018 IR.[1] The department is continuing the effort to re-evaluate and establish more regionally appropriate DO criteria in Louisiana water bodies in other ecoregions within the state.

## Coastal Recreation Criteria

The CWA, as amended by the Beaches Environmental Assessment and Coastal Health (BEACH) Act in 2000, requires each state having coastal recreation waters to adopt and submit to the USEPA water quality criteria for those pathogens and pathogen indicators for which USEPA has published criteria under CWA §304(a). Coastal recreation waters are defined as "(i) the Great Lakes; and (ii) marine coastal waters (including coastal estuaries) that are designated under CWA §303(c) by a state for use for swimming, bathing, surfing, or similar water contact activities" (USEPA 2000). Louisiana has marine coastal waters that are designated as primary contact recreation (e.g., swimming) waters; therefore, Louisiana is bound by the requirements of the BEACH Act.

Previous to the 2000 BEACH Act, USEPA had published recommended enterococci pathogen criteria for protection of marine recreational waters in 1986. At that time, Louisiana did not adopt the updated pathogen criteria based on the 1986 recommendations, which resulted in USEPA promulgating coastal pathogen criteria for Louisiana, and 20 other states, in 2004 (USEPA 2004). Pursuant to the BEACH Act, USEPA updated pathogen criteria to protect recreational waters and published the updated recommendations in December 2012 (USEPA 2012), which again required Louisiana to adopt the use of the updated enterococci criteria in marine coastal waters or risk promulgation of federal criteria by the USEPA. On May 20, 2016 LDEQ adopted enterococci criteria for its coastal marine and estuarine recreation waters. The adoption of enterococci criteria provides for: (1) an expanded definition of illness; (2) the ability to capture more pathogens in the testing methods; and (3) the use of a multi-criteria system when and where fecal coliform criteria still apply. Each one of these factors, together or on its own, provides for an improved public health protection monitoring program. For the 2018 IR the new coastal marine and estuarine enterococci criteria, where required, were applied using newly collected enterococci data obtained by LDEQ and in some cases LDH.

## 2016 Triennial Review

The Clean Water Act and federal regulations require that states hold public hearings at least once every three years to review applicable surface water quality standards and, as appropriate, adopt new or modified standards, taking into consideration public concerns, EPA guidance, and new scientific and technical information. This process is called a *triennial review*. The triennial review also provides an opportunity to discuss the priorities and commitments the agency makes with EPA and others regarding surface water quality standards.

Louisiana's Water Quality Standards (WQS) can be found in LAC 33:IX.Chapter 11. A triennial review is conducted to evaluate the need to update or revise the WQS in order to remain consistent with state and federal law. The review will also ensure that Louisiana's WQS continue to reflect the best available science and support sound water quality management policies to improve and protect the water resources of the state.

[1] Dissolved oxygen assessments based on the eLMRAP dissolved oxygen criteria are subject to change pending the outcome of current litigation against USEPA.

A triennial review began on January 20, 2016 with a potpourri notice in the *Louisiana Register* announcing the review and soliciting comments on the WQS. A public hearing was held on March 30, 2016 to solicit oral comments. Written comments were received from the public and within LDEQ. After the comment period closed on March 30, 2016, all comments were reviewed, summarized, prioritized and responses were developed based on the needs of the department, resources available, and staffing and time constraints. A Report of Findings from the 2016 Triennial Review was submitted to the USEPA Region 6 on March 9, 2017. Currently, a rule is in development to address those areas of the WQS that were determined to be necessary and capable of being accomplished within the timeframe of the 2016 Triennial Review.

## Minerals Criteria Review

Louisiana's numeric water quality criteria for minerals, specifically chloride, sulfate and TDS, were last revised in 1994. Other than the site-specific UAAs that have demonstrated minerals levels are protective of designated uses, LDEQ's minerals criteria were not established with a direct connection to support a particular designated use. Therefore, LDEQ began a review of the numeric water quality criteria for minerals. A detailed report reviewing the minerals criteria was completed in March 2016. The purpose of this report was to: 1) compile a comprehensive dataset of minerals-related water quality parameters from several LDEQ projects; 2) establish a range of mineral ion components in state waters; and 3) provide a foundation for future minerals-related water quality standards development. Nineteen water quality parameters (alkalinity, bicarbonate, calcium, chloride, fluoride, hardness, iron, magnesium, manganese, nitrate-nitrite, pH, phosphorus, potassium, salinity, silica, sodium, specific conductivity, sulfate, and total dissolved solids) were characterized with descriptive statistics by ecoregion, river basin and waterbody type.

## Turbidity Criteria in Pearl River Review

LDEQ is currently evaluating the turbidity criterion of two subsegments in the Pearl River Basin. The two subsegments, LA090205_00 (Wilson Slough–From Bogue Chitto to West Pearl River (Scenic), and LA090206_00 (Bradley Slough–From Bogue Chitto to West Pearl River (Scenic), are both designated as Outstanding Natural Resource Waters (ONRs) with a 25 NTU (nephelometric turbidity units) turbidity criterion (LAC 33:IX.1113.B.9.b.v). An issue exists with the turbidity criterion in the two subsegments since the Pearl River furnishes over 80% of the water flowing into Wilson Slough; with the Pearl River having a turbidity criteria of 50 NTU. The evaluation and probable revisions should resolve the turbidity issue in the two subsegments.

## Methods and Analyses Used to Revise Standards

Section 303(c) of the CWA requires a state to hold public hearings at least once every three years for the purpose of reviewing its water quality standards and to revise or adopt standards as needed. The CWA also requires USEPA to ensure that a state's standards are consistent with the CWA.

Louisiana's Surface Water Quality Standards provide that "standards are not fixed for all time, but are subject to future revision…" (LAC 33:IX.1109.H). Revisions to the water quality standards occurs routinely as new data and information become available. Water quality standards are reviewed to ensure criteria remain protective of existing conditions and uses and for future water quality management goals.

Part of the review process includes an assessment of the state's numeric water quality criteria for toxic pollutants and the occurrence of toxic pollutants in state waters. Technical sources of information are reviewed in order to establish the appropriate criteria for pollutants. The review

takes into consideration many factors, including the state's current water quality condition, designated uses, violation summaries, wastewater discharge summaries, Toxics Release Inventory data, survey data, and other pertinent information. LDEQ has adopted numeric water quality criteria for toxic pollutants based on known or suspected occurrence of the substances in Louisiana waters and potential threat to attainment of designated uses.

Based on LDEQ's review of the existing water quality standards, recent USEPA guidance and policies, and public comments, revisions may include, but are not limited to:

- New toxic or other criteria
- Modifications to designated uses
- Subsegment delineations and/or description revisions (e.g., corrections and changes)
- Clarifications to regulatory language
- Updates to water quality policies

The water quality standards revision process involves procedures for thorough technical review of USEPA-recommended policy and criteria, review by state and federal agencies and the public, final approval by USEPA, promulgation of the revisions into regulations, and certification by the state legal authority (see Certification of Standards by State Legal Authority, below) that the standards revision and regulation development process meets all applicable state laws and regulations.

## Antidegradation Policies

The CWA and federal regulations require all states to have an antidegradation policy and to identify the methods for implementing the policy (40 CFR. 131.12). Louisiana's Antidegradation Policy (the Policy) and Implementation Plan (the Plan) are contained in the Surface Water Quality Standards (LAC 33:IX.1109.A and 1119). The Policy and Plan provide the basis for the protection of state waters from activities that may cause degradation of the water quality and impairment of the existing and designated uses. The Antidegradation Policy and Implementation Plan have been approved by USEPA-Region 6 and meet the requirements of the federal regulations. LAC 33:IX.1119 specifies that implementation procedures and methods will be included in the Continuing Planning Process, with additional Water Quality Management Plan documentation developed as needed. LDEQ has been working with USEPA-Region 6 to develop more detailed implementation procedures, in part, to fulfill federal and state regulatory requirements, as well as to provide specific guidance to permit applicants and consolidate all specific procedures related to antidegradation into one document.

## Certification of Standards by State Legal Authority

In accordance with §303(c) of the CWA and the certification process outlined in 40 CFR 131.21, an official copy of the final regulation, as published in the Louisiana Register, is submitted, by LDEQ's Executive Counsel, to USEPA-Region 6. USEPA will either approve or disapprove the state-adopted water quality standard, and only a USEPA-approved standard is suitable for CWA implementation.

## Basis for Standards and Policies Not Covered by the CWA

The Louisiana Water Quality Standards, in addition to meeting minimum federal and state water quality protection requirements, contain standards and policies that are not driven by federal statute or regulation. The additional standards and policies include, but are not limited to: allowance for

compliance schedules, variances, and short term activity authorizations; classification of non-perennial and other water body types such as manmade water bodies; establishment of critical flows for water quality assessments and permitting activities; allowance of mixing zones for permitted dischargers; and implementation policies and procedures for general criteria.

## Water Quality Monitoring and Assessment Program

LDEQ conducts extensive surface and groundwater sampling throughout Louisiana in order to obtain information regarding the quality of Louisiana's surface water and groundwater resources. Data obtained from this program is used to develop reports, including the *2018 Water Quality Inventory: Integrated Report*, in order to inform the public, state agencies, and federal agencies about the quality of Louisiana water. More information on this program can be found in Part III of this report.

## Point Source Control Program

### Introduction

Louisiana's water pollution control program is carried out primarily by LDEQ. LDEQ operates to preserve the integrity of Louisiana's waters through the use of various point source and NPS programs. All offices within LDEQ have some responsibility for implementing water pollution control programs. These offices include the Office of the Secretary (regulatory development), the Office of Management and Finance (grants and contracts, information services, clean water state revolving fund), the Office of Environmental Services (OES) (municipal and industrial wastewater discharge permitting, and water quality certification program), the Office of Environmental Assessment (water quality standards, water quality assessment, nonpoint source program, TMDL development), the Office of Environmental Compliance (OEC) (surveillance and enforcement of permit requirements and pollution control regulations, investigation of complaints and spills). An overview of LDEQ's organizational structure for all activities can be found at: http://deq.louisiana.gov/page/org-charts. The following sections address various facets and recent activities of the point source water pollution control program.

### Clean Water State Revolving Fund Program

The Clean Water State Revolving Fund (CWSRF) Program provides financial assistance for the construction of projects to enhance and improve water quality in Louisiana. Loans are below market rate and may be used for water quality improvement projects in Louisiana communities. Monies for the Revolving Loan Program originated with the 1987 amendments to the CWA. A new authority was created, allowing USEPA to make grants to capitalize State Water Pollution Control Revolving Funds. On the state level this authority is granted by, R.S. 30:2011(D)(4), and R.S. 30:2301-2306 (Act 296 of the 2010 Regular Session of the Louisiana legislature). This statute established a state revolving loan fund capitalized by federal grants (Capitalization Grants for CWSRF, Catalog of Federal Domestic Assistance (CFDA) 66:458), by state funds when required or available, and by any other funds generated by the operation of the clean water revolving loan fund. Loans are made for no longer than 20 years and may be repaid through sales taxes, user fees, ad valorem taxes, or a combination of funds. An interest payment on the amount drawn begins within six months of the loan closing and is billed every six months until the loan is paid in full.

After a two-year construction period, loan recipients begin repayment of principal to LDEQ. That money is then available for loans to other communities. Thus, the revolving loan fund is a permanent source of funds for Louisiana municipalities.

As of June 2017, USEPA, through LDEQ, has awarded $469,854.923 in fund capitalization grants to Louisiana. With the required 20% state match of $85,442.963, less 4% for administration fees, there is a total of $536,503,689 that has been made available for loans to communities. In addition, a total of $574,019,722 of repaid "recycled" loan monies has been made available for loans.

As of June 2017, 226 loans to communities totaling $1,022,982,628 have been closed utilizing USEPA grants, state match, and recycled payments from previous loans. Another 19 requests for loans totaling $179,272,565 have been received and are in the application process. For more information on the Clean Water State Revolving Fund refer to:
http://www.deq.louisiana.gov/CWSRF.

## Water Discharge Permits

Water discharge permits are official authorizations developed and issued by the OES of LDEQ. The Louisiana Pollutant Discharge Elimination System (LPDES) permit establishes the effluent limitations and conditions for wastewaters discharged into waters of the state. The permitting process allows the state to control the amounts and types of wastewaters discharged into its surface waters. A permit is required for the discharge of pollutants from any point source discharge into waters of the state of Louisiana. In 1996, LDEQ assumed responsibility for administering the permitting, compliance, and enforcement activities of the National Pollutant Discharge Elimination System (NPDES) from the USEPA. USEPA retained responsibility for the federal sewage sludge disposal program. More information on LDEQ's water discharge permits program can be found at: http://deq.louisiana.gov/pages/lpdes.

From October 1, 2015 through September 30, 2017, the following permits were issued:

**Table 2.2.2**

**Louisiana Pollutant Discharge Elimination System water discharge permits and modifications issued from October 2015 through September 2017.**

| State Permit | Number of Permits | Number of Permits (including modifications) |
|---|---|---|
| Minor Sanitary | 121 | 122 |
| Major Sanitary | 32 | 37 |
| Minor Industrial | 303 | 322 |
| Major Industrial | 42 | 54 |
| Major MS4[1] | 1 | 1 |
| Stormwater General | 635 | 635 |
| Non-Stormwater General[2] | 858 | 976 |
| **Totals** | **1,992** | **2,147** |

[1] Major Municipal Separate Storm Sewer System Permits
[2] Does not include 2,300 permits re-authorized when master general permits were reissued

## Use or Disposal of Sewage Sludge and Biosolids

Use or disposal options for sewage sludge and biosolids in Louisiana consist of incineration, disposal in a permitted landfill, or treatment of the sewage sludge into biosolids for beneficial use through land application as a soil conditioner and/or crop fertilizer. An alternative is to have sewage sludge pumped out and transported offsite for additional treatment for final use and disposal. Sewage Sludge and Biosolids Use or Disposal Permits are official authorizations developed and issued by the OES of LDEQ. The Sewage Sludge and Biosolids Use or Disposal Permit establishes the monitoring requirements, sampling frequency, operational standards, and recordkeeping for sewage sludge and biosolids that is pumped out and transported offsite for additional treatment for use or disposal, biosolids disposed in a landfill, land application of biosolids, and incineration of biosolids. Effective January 1, 2013, all regulated LPDES-permitted sewage treatment facilities must have applied for or obtained a Sewage Sludge and Biosolids Permit. Transporters of sewage sludge must register annually with LDEQ, comply with the standards for vehicles transporting sewage sludge, maintain accurate records through daily logs and manifests, and submit reports to LDEQ on an annual basis. More information on LDEQ's sewage sludge and biosolids program can be found at: http://deq.louisiana.gov/page/sewage-biosolids

The Louisiana Department of Environmental Quality has not yet assumed the Sewage Sludge Management Program from the Environmental Protection Agency (EPA); therefore, issuance of

coverage does not exempt the individual/company/facility from having to meet the EPA requirements for the "Standards for the Use or Disposal of Sewage Sludge" at 40 CFR Part 503.

From October 1, 2015 through September 30, 2017, the following permits and/or registrations were issued:

**Table 2.2.3**

**Sewage Sludge and Biosolids Use or Disposal Permits and Modifications Issued from October 2015 through September 2017.**

| State Permit | Number of Permits | Number of Permits (including modifications) |
|---|---|---|
| Individual Commercial Preparer – Out-of-State | 17 | 17 |
| Individual Commercial Preparer – Exceptional Quality | 3 | 3 |
| Individual Commercial Preparer – Class B | 5 | 5 |
| LAJ650000 (Disposal in a Landfill) | 20 | 20 |
| LAJ660000 (Pump Out and Haul Off)[1] | --- | --- |
| **Totals** | **45** | **45** |
| **Average for Sewage Sludge Transporter Registrations[2]** | **300** | **300** |

[1] All LPDES permitted facilities that have a sanitary outfall are automatically covered under the LAJ660000 permit, unless a different disposal method for sewage sludge is used. Currently, 6, 868 facilities have coverage.

[2] Average is obtained by the number of registrations issued in the following permitting years: 7/1/2015-6/30/2016, 7/1/2016-6/30/2017, and 7/1/2017-6/30/18.

## Surveillance Division Compliance Assurance Inspections

Municipal, industrial, federal, and agricultural point source dischargers are monitored to verify compliance with permitted effluent limitations and compliance schedules. The information derived from this program can also be applied to the interpretation of state water quality data and can be used as input to water quality plan development.

The types of compliance inspections undertaken by the Surveillance Division (SD) that are reported here include:

- Compliance Evaluation Inspections (CEI): Non-sampling inspections are designed to verify permittee compliance with applicable LPDES permit requirements and compliance schedules.
- Compliance Sampling Inspections (CSI): Samples of the influent and/or effluent are collected and analyzed to determine permit compliance, in addition to the inspection activities performed in the CEIs.

The following reported numbers do not include complaint or release/spill-related inspections. The following compliance inspection activities were conducted from October 2015 through September 2017:

**Table 2.2.4**

**Louisiana Department of Environmental Quality, Office of Environmental Compliance, Surveillance Division Water Quality Compliance Inspections performed October 2015 through September 2017.**

| Inspection Type | Number of Inspections |
|---|---|
| Compliance Evaluation Inspections | 1,273 |
| Compliance Sampling Inspections | 10 |
| **Total WQ Compliance Inspections** | **1,283** |

## Surveillance Division Incident Investigations

The SD of the OEC received 14,541 Incident Notifications (Complaints or Release/Spills) across all media (air, water, hazardous waste, underground storage tanks, etc.) from October 2015 through September 2017. Each notification requires an investigation and an incident report. If action is deemed necessary following the initial investigation, the investigator refers the situation to the appropriate division for enforcement action, permit action, or remedial action. The division receives notifications that include reports of oil spills, sewage overflows, bypasses, water permit excursions, chemical spills, fish kills, unusual coloring in a stream, and illegal discharges. Environmental complaints are made to LDEQ's Single Point of Contact (SPOC) at: http://deq.louisiana.gov/page/file-a-complaint-report-an-incident. Notifications of emergencies and spill and release notifications are reported to the Louisiana State Police (LSP). LSP then notifies the LDEQ staff person on-call. More information on DEQ's Surveillance Division can be found at: http://deq.louisiana.gov/page/surveillance.

**Table 2.2.5**

**Louisiana Department of Environmental Quality, Office of Environmental Compliance, Surveillance Division incident investigations performed October 2015 through September 2017.**

| Notification Type | Number of Notifications |
|---|---|
| Complaint Notifications | 5,915 |
| Release/Spill Notifications | 5,277 |
| **Total Notifications** | **11,192** |

## Surveillance Division Identification of Unpermitted Point Sources

The LDEQ Compliance Monitoring Strategy (LDEQ 2016a) outlines approaches for monitoring permit compliance to aid in addressing potential point source issues. From October 1, 2015 thru September 30, 2017, the LDEQ Surveillance Division conducted 1,856 water inspections within 304 subsegments in Louisiana.

Additionally, the LDEQ Surveillance Division performs Watershed Based Inspection Projects under the Compliance Monitoring Strategy to identify nonpoint sources and unpermitted point source dischargers within targeted subsegments.

From October 1, 2015 thru September 30, 2017, the LDEQ Surveillance Division conducted Watershed Based Inspections in 20 subsegments.

**Table 2.2.6**

**Louisiana Department of Environmental Quality, Office of Environmental Compliance, Surveillance Division, Watershed Based Inspection Project results for EPA FY 2016 - 2017.**

| Subsegment Number | Waterbody Segment Description | Inspections | Notice of Deficiency (NOD) |
|---|---|---|---|
| LA020601_00 | Intracoastal Waterway - From Bayou Villars to Mississippi River | 154 | 43 |
| LA030201_00 | Calcasieu River - From Marsh Bayou to saltwater barrier | 6 | 6 |
| LA030506_00 | Bundicks Creek - From headwaters to Bundicks Lake | 1 | 1 |
| LA030801_00 | West Fork Calcasieu River - From confluence with Beckwith Creek and Hickory Branch to main stem of Calcasieu River | 9 | 9 |
| LA030805_00 | Indian Bayou - From headwaters to West Fork Calcasieu River | 3 | 3 |
| LA040904_00 | Bayou Cane - From US-190 to Lake Pontchartrain | 46 | 21 |
| LA040914_00 | Bayou Cane - From US Hwy 190 to CDM Ecoregion boundary | 4 | 4 |
| LA060211_00 | West Atchafalaya Borrow Pit Canal - From Bayou Courtableau to Henderson; includes Bayou Portage | 26 | 10 |
| LA060301_00 | Bayou Teche - From headwaters at Bayou Courtableau to Keystone Locks and Dam | 7 | 4 |
| LA060703_00 | Bayou Du Portage | 2 | 0 |

**Table 2.2.6**

**Louisiana Department of Environmental Quality, Office of Environmental Compliance, Surveillance Division, Watershed Based Inspection Project results for EPA FY 2016 - 2017.**

| Subsegment Number | Waterbody Segment Description | Inspections | Notice of Deficiency (NOD) |
|---|---|---|---|
| LA060903_00 | Bayou Tigre - From headwaters to Bayou Petite Anse | 11 | 4 |
| LA070501_00 | Bayou Sara - From Mississippi state line to Mississippi River | 30 | 17 |
| LA070505_00 | Tunica Bayou - From headwaters to Mississippi River | 2 | 2 |
| LA080903_00 | Big Creek - From headwaters to Boeuf River; includes Big Colewa Bayou | 2 | 2 |
| LA080905_00 | Turkey Creek - From headwaters to Turkey Creek Cutoff; includes Turkey Creek Cutoff, Big Creek, and Glade Slough | 19 | 19 |
| LA081001_00 | Bayou Macon - From Arkansas state line to Tensas River | 26 | 22 |
| LA081606_00 | Fish Creek – From headwaters to Little River (Scenic) | 1 | 0 |
| LA081609_00 | Hemphill Creek - From headwaters to Catahoula Lake; includes Hair Creek | 1 | 1 |
| LA101302_00 | Iatt Lake | 1 | 0 |

## Water Quality Certification

Water quality certification is an activity of the General and Municipal Permits Section of the Water Permits Division in the Office of Environmental Services of LDEQ. Certification is required for any federal license or permits that result in a discharge to navigable waters. The certification indicates that any such discharge will not violate water quality standards of the state. Activities that may result in discharges include land clearance, excavating, grading and/or filling for residential and commercial development, oil and gas activities, and municipal infrastructure projects. Section 401 of the CWA requires water quality certification for all § 404 permits administered by the U.S. Corps of Engineers and certain federal licenses administered through FERC (Federal Energy Regulatory Commission). From October 1, 2015 through September 30, 2017, 527 water quality certifications for individual permit actions were issued by LDEQ. More information on LDEQ's water quality certification program can be found at: http://deq.louisiana.gov/page/quality-certifications.

## Enforcement

The enforcement activities of the LDEQ Water Enforcement Section (WES) are designed to ensure that all possible infringements of water quality standards, rules, and regulations are handled in a rapid and consistent manner. To prevent pollution of the waters of the state and to ensure remediation in the event of pollution, the WES coordinates its enforcement activities with other sections in LDEQ, especially the Water Permits Division in the OES and the SD of the OEC. Field investigations, file reviews, permit noncompliances, and reviews of discharge monitoring reports are all used to initiate enforcement actions. The WES initiates all formal enforcement actions and follows the actions through all appropriate levels to ensure full compliance with state laws and regulations. LDEQ seeks to provide a clean, healthy environment through protection of the state's water resources by the reduction of pollution, education of the public, and consistent, open, and accountable application of standards, rules, and regulations. More information on LDEQ's WES can be found at: http://deq.louisiana.gov/page/water-enforcement.

From October 2015 through September 2017, the following enforcement activities were recorded:

**Table 2.2.7**

**Louisiana water quality environmental enforcement actions issued from October 2013 through September 2015.**

| Enforcement Actions | Number |
|---|---|
| Notice Of Corrected Violations/ Notice of Violations | 91 |
| Compliance Orders (CO)[1] | 284 |
| Amended Compliance Orders | 40 |
| Notice of Potential Penalty (NOPP) | 14 |
| Administrative Orders | 5 |
| Penalties[2] | 183 |
| Settlement Agreements | 61[3] |
| Attended Educational Class (Sanitary Wastewater Assistance Training) | 219 |

[1] Includes CO and Consolidated CO/NOPP

[2] Includes Penalties and Expedited Penalties (XP)

[3] Includes Water and Multi-media Settlement Agreements that have a Water component

**Table 2.2.8**

**Louisiana water quality environmental penalties issued from October 2015 through September 2017.**

| Penalties | Dollar Value |
|---|---|
| Penalties Issued | $296,103.56 |
| Penalties Paid | $209,737.13 |
| Penalties Appealed | 2 |
| Cash From Settlement Agreements[1] | $965,909.39 |
| Total Value of BEPs[2] | $729,925.00 |

[1] Includes Multi-Media Settlement Agreements
[2] Beneficial Environmental Projects

## Nonpoint Source Program

### Section 319 of the Clean Water Act

Section 319 of the CWA required the governor of each state to develop a Nonpoint Source Assessment Report and an NPS Management Plan to identify NPS pollutants and describe management strategies and a timeline for implementation http://water.epa.gov/polwaste/nps/index.cfm. In response to this federal law, the Louisiana Legislature passed Revised Statute 30:2011, signed by the governor in 1987 as Act 272. This law directed LDEQ, designated as lead agency for the NPS program, to develop and implement an NPS Management Program. The NPS Management Program was developed to facilitate coordination with appropriate state agencies including, but not limited to Louisiana Department of Natural Resources (LDNR), Louisiana Department of Wildlife and Fisheries (LDWF), Louisiana Department of Agriculture and Forestry (LDAF), and Louisiana State Soil and Water Conservation Commission, in areas pertaining to their respective jurisdictions.

### Nonpoint Source Management Program

Section 319(b) required states to prepare an NPS Management Plan, including these elements (all references to sections, subsections, paragraphs, and subparagraphs are from CWA § 319):

- An identification of BMPs and measures which will be undertaken to reduce pollutant loadings resulting from each category, subcategory, or particular NPS designated under paragraph (1)(B), taking into account the impact of the practice on groundwater quality.
- An identification of programs (including, as appropriate, non-regulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, training, technology transfer, and demonstration projects) to achieve implementation of BMPs by categories, subcategories, and particular nonpoint sources designated under subsection (A).
- A schedule containing annual milestones for: (1) utilization of program implementation methods identified in subparagraph (B); and (2) implementation of BMPs identified in subparagraph (A) by the categories, subcategories or particular nonpoint sources designated under paragraph (1)(B). Such schedule shall provide for utilization of the BMPs at the earliest practicable date.

- A certification of the attorney general of the state or states (or the chief attorney of any state water pollution control agency which has independent legal counsel) that the laws of the state or states, as the case may be, provide adequate authority to implement such management program or, if there is not such adequate authority, a list of such additional authorities as will be necessary to implement such management program, and a schedule and commitment by the state or states to seek such additional authorities as expeditiously as practicable.
- Sources of federal and other assistance and funding (other than assistance provided under subsections (h) and (i)) which will be available in each of such fiscal years for supporting implementation of such practices and measures and the purposes for which such assistance will be used in each of such fiscal years.
- An identification of federal financial assistance programs and federal development projects for which the state will review individual assistance applications or development projects for their effect on water quality pursuant to procedures set forth in Executive Order 12372 as in effect on September 17, 1983, to determine whether such assistance applications or development projects would be consistent with the program prepared under this subsection; for the purposes of this subparagraph, identification shall not be limited to the assistance programs or development projects subject to Executive Order 12372 but may include any programs listed in the most recent Catalog of Federal Domestic Assistance which may have an effect on the purposes and objectives of the state's NPS pollution management program.

In 1993, USEPA approved Louisiana's NPS Assessment Report and Management Plan. In November 2012, USEPA-Region 6 approved Louisiana's revised NPS Management Plan. LDEQ is currently drafting an amendment to the 2012 NPS Management Plan to include statewide and watershed implementation tasks to partially and/or fully restore NPS-impaired waters from 2016 to 2021. The amendment will include an updated priority list as well as criteria used to establish this list. Milestones will be updated and discussions on how NPS programs align with the amendment will be included in the addendum.

## Watershed Planning and Management

USEPA and LDEQ developed a watershed approach as a geographically-based, systematic process to reduce NPS pollution and improve water quality. Watershed planning can be an effective management strategy to protect healthy waters and/or restore impaired waters. Through watershed assessment, water quality data is analyzed; if the water body is impaired, a TMDL, watershed implementation plan (WIP), or some alternative plan is developed and implemented.

USEPA outlined a set of nine key elements for an acceptable WIP, and LDEQ utilizes this outline as a guide in partnering with stakeholders on protection and/or restoration of NPS waters. These nine key elements include:

- An identification of geographic extent of the watershed, measurable water quality goals, causes, and sources to be controlled to restore water quality
- A description of NPS management practices to achieve estimated load reductions
- A description of agencies and programs to implement NPS management practices
- An identification of sources and amounts of financial and technical assistance to implement NPS management practices

- An educational outreach component to implement the WIP
- A reasonably expeditious schedule for implementing the WIP
- A description of interim, measurable milestones for determining whether NPS management practices or other control actions are being implemented
- An adaptive implementation process that includes a set of criteria that can be used to determine: (1) whether NPS load reductions are being achieved; (2) whether substantial progress is being made toward attaining or assuring continued attainment of water quality standards and, if not, the criteria for determining whether WIPs should be revised; and (3) where an NPS TMDL has been established, whether an NPS TMDL needs to be revised or a new TMDL developed
- A monitoring component to evaluate effectiveness of WIPs in restoring water quality and designated uses in NPS waters

## Implementation

The Louisiana Administrative Code (LAC 33:IX.1105. Definitions) defines NPS pollution as "a diffuse source of water pollution that does not discharge through a point source, but instead, flows freely across exposed natural or manmade surfaces such as agricultural or urban runoff and runoff from construction, mining, or silviculture activities that are not regulated as point sources."

NPS pollutants are typically undiscernible or unconfined discharges that enter a water body during rainfall events. Land-use activities identified as contributing to NPS pollution include agriculture, forestry, urban, home sewage treatment systems, construction, hydromodification, and resource extraction (sand and gravel mining). The type of NPS pollution associated with land-use activities includes sediment, nutrients, metals, organic material, and bacteria. Some of these pollution sources are managed through stormwater permits, and others are managed through NPS programs.

LDEQ's NPS Program focuses on improving water quality in impaired waters and protecting healthy waters from becoming impaired. The primary objective of the NPS Management Program is to implement BMPs as well as educational outreach programs to reduce NPS pollution. The watershed planning process relies on many partnerships and collaborative efforts to provide information on water quality conditions and land-use activities. As water quality improves, causes of impairment may be removed from the state's § 305(b) impaired list, and a success story can be published on USEPA's NPS success story website. LDEQ will be revising the list of priority watersheds for implementation in 2018.

Through the NPS Program, watershed groups have partnered with LDEQ-NPS to assist in restoring watersheds on a local level. They identify and engage local stakeholders to get involved and contribute resources and assistance. The stakeholders assist in planning, water quality monitoring, education and outreach, and BMP implementation.

An important partner in Louisiana's NPS Program is the LDAF; this agency implements the agricultural component of the program. LDAF currently applies directly to USEPA for the incremental portion of § 319 funds and utilizes those funds for BMP implementation in watersheds where TMDLs and WIPs have been developed. LDEQ and LDAF prioritize impaired watersheds and exchange information on water quality data and land-use practices.

Two more important partners in Louisiana's NPS Program are the Source Water Protection Program (SWPP) and the ASSET Program. SWPP partners with local communities in Louisiana to protect drinking water supplies from existing and potential contamination from NPS pollution.

One of SWPP's priorities has been reducing bacterial problems from home sewage treatment systems for many communities in Louisiana. Since bacterial problems cause water bodies to be listed on the § 303(d) list, SWPP has focused its efforts on water bodies designated as drinking water supplies, such as Bayou Lafourche, Sibley Lake, and Lake Bruin. The ASSET Program is an ambient groundwater sampling and analysis program that monitors Louisiana's major freshwater aquifers. These aquifers, such as the Sparta, Chicot, and Southern Hills Aquifer System, are also sources of drinking water that could be contaminated by NPS pollution.

One of the remaining challenges in Louisiana is partnering with urban area communities on their NPS pollution problems. Many cities are now required to manage pollutants through stormwater permits. Innovative technologies such as rain gardens, porous pavements, green roofs, and small wetland detentions, or swales, could be effective in retaining nutrients on site rather than discharging them to water bodies. LDEQ will continue to provide information to cities and rural communities on innovative solutions for reducing urban NPS pollutants.

# Chapter 3: Cost/Benefit Assessment

## Cost Information

A true cost/benefit assessment for the water quality management efforts of LDEQ is very difficult to obtain because research on the economic value of incremental improvements in water quality is not currently available. While recent economic research has begun to place monetary values on otherwise intangible environmental benefits such as wilderness for nonconsumptive recreation, such efforts have not taken place in the area of water quality. In lieu of a formal cost/benefit assessment of water quality improvements, LDEQ is providing information on pollution abatement capital expenditures and operating costs. To place these expenditures in perspective, financial information on activities that benefit from this investment is also provided.

Much of LDEQ's water quality-related budget is self-generated through permit fees and enforcement actions; however, a portion is derived through federal grants. The grants include the CWA § 319 grant for NPS management activities, the §604 grant for state water quality management planning activities, and the §106 grant for water pollution control activities. Money from each of the grants programs is divided throughout the water quality-related program areas and provides funding for personnel, equipment, survey work, TMDL development, water quality management planning, monitoring, assessment, surveillance, and enforcement. See Table 2.3.1 for an illustration of LDEQ's approximate yearly costs to implement the CWA. Described below are a few of the programs and activities supported by each of these federal grants and state funds.

Under the § 319 grant for NPS management issues, LDEQ continues to work with a number of partners on projects targeting NPS pollutants from urban runoff, forestry, agriculture, sand and gravel operations, and home sewage treatment systems. Other agency and funding programs that are also aimed at improving water quality through implementation of BMPs and cost incentives include Environmental Quality Incentive Program (EQIP), Wildlife Habitat Incentive Program (WHIP), and the Wetland Reserve Program (WRP). During FY2012 and FY2013, the U.S. Department of Agriculture (USDA) obligated $42,128,318 in federal funds through the EQIP/National Resources Conservation Service program to implement agricultural BMPs on 347,827 acres of land in order to reduce the amount of NPS pollutants entering water bodies in the state. During this same time period, an additional $1,268,058 in federal funds was utilized to implement the WHIP on 5,035.5 acres of private lands. During FY2012 and FY2013, the WRP enrolled 37,820.7 acres of land in wetland protection programs totaling $70,561,351 in federal funds. These programs, along with LDEQ's NPS Program, are intended to reduce water quality impacts from agricultural production in Louisiana. In Part II, Chapter 2, the Nonpoint Source Program section has more information on this topic as well as other efforts by the NPS Program at LDEQ. For more information on LDEQ's NPS Program refer to: http://nonpoint.deq.louisiana.gov/.

Section 604 grant monies are used to support the development and revisions of TMDLs. Section 303(d) of the CWA requires the identification and listing of impaired waters and prioritization of the impaired waters for TMDL development. For more information on LDEQ's TMDL program refer to: http://deq.louisiana.gov/page/tmdl.

**Table 2.3.1.**

**Approximate yearly costs (FY2017) to implement the Clean Water Act by the Louisiana Department of Environmental Quality and its contractors, October 1, 2016 – September 30, 2017.**

| Description | Amount |
|---|---|
| **Federal Funds** | |
| CWA Section 106 | $4,986,091 |
| CWA Section 106 supplemental (estimate) | $142,147.50 |
| CWA Section 604(b) | $88,026.40 |
| CWA Section 319 | $378,200 |
| FY14 Exchange Network Grant | $104,461.42 |
| FY15 Exchange Network Grant | $11,732.83 |
| Clean Water State Revolving Loan Fund (Administrative Costs) | $2,693,608 |
| **Total Federal Funds** | **$9,793,237** |
| | |
| **State Funds** | |
| Environmental Trust Fund and Other Fees | $10,890,094 |
| General Fund | $0 |
| **Total State Funds** | **$10,890,094** |
| **Grand Total** | **$20,683,331** |

The §106 grant provides funding support for the entire water pollution control/water quality management program. Activities supported by the §106 grant include ambient water quality monitoring, assessment of ambient water quality data, development of the Water Quality Integrated Report, revision of Louisiana's Water Quality Management Plan, development and revision of surface water quality standards, development and issuance of wastewater discharge permits, compliance inspections, complaint investigations, and development of enforcement actions. §106 grant funding for FY 2017 was approximately $5,128,238 (Table 2.3.1).

The Clean Water State Revolving Fund Program provides financial assistance to communities for the construction of projects to enhance and improve water quality in Louisiana. Loans are below market rate and may be used for water quality improvement projects in Louisiana communities. Monies for the Revolving Loan Program originated with the 1987 amendments to the CWA. A

new authority was created, allowing USEPA to make grants to capitalize State Water Pollution Control Revolving Funds. On the state level, R.S. 30:2011(D)(4) and R.S. 30:2301-2306 (Act 296 of the 2010 Regular Session of the Louisiana legislature) were enacted. These statutes established a state revolving loan fund capitalized by federal grants (Capitalization Grants for Clean Water State Revolving Funds, CFDA 66:458), by state funds when required or available, and by any other funds generated by the operation of the clean water revolving loan fund. Loans are made for no longer than 20 years and may be repaid through sales taxes, user fees, ad valorem taxes, or a combination of funds. An interest payment on the amount drawn begins within six months of the loan closing and is billed every six months until the loan is paid in full. After a two-year construction period, loan recipients begin repayment of principal to LDEQ. That money is then available for loans to other communities. Thus, the revolving loan fund is a permanent source of funds for Louisiana municipalities.

As of June 2017, USEPA, through LDEQ, has awarded $469,854,923 in fund capitalization grants to Louisiana communities. With the required 20% state match of $$85,442,963, less 4% for administration fees, there is a total of $536,503,689 that has been made available for loans to communities. For FY2017, 226 loans to communities totaling $1,022,982,628 have been closed utilizing USEPA grants, state match, and recycled payments from previous loans. Another 19 requests for loans totaling $179,272,565 have been received and are in the application process.For more information on the Clean Water State Revolving Fund refer to:
http://www.deq.louisiana.gov/CWSRF.

Data on pollution abatement capital expenditures and operating costs from the U.S. Census Bureau publication *Pollution Abatement Costs and Expenditures: 2005* has been included to provide estimates of costs to industry related to water quality protection and improvement. For 2005, the most recent year for which data is available, industry in Louisiana spent $89.2 million in capital expenditures to protect water quality, with the petroleum industry ($61.2 million), chemical industry ($25.3 million), and paper industry ($0.8 million) leading in dollars spent. For the same period, water quality-related pollution abatement operating costs for Louisiana industry totaled $530.4 million with spending led by the chemical sector ($301 million), petroleum industry ($173.1 million), and paper industry ($40.6 million). This represents a $619.6 million outlay for water pollution control-related expenses (U.S. Census Bureau 2008).

In an attempt to place state and industry expenditures in perspective and to provide an approximation of a cost/benefit assessment, information is provided below on the size of Louisiana's water resource base and its direct and indirect economic benefits to the state.

## Benefits Information

Louisiana's water resources occupy 9,174 square miles of the total state surface area of 43,204 square miles.[2] LDEQ is thus directly or indirectly responsible for protecting the water quality of approximately 17.5% of the total surface area of the state. In many instances, protection of surface waters also involves the management of stormwater runoff from land-based activities such as farming, aquaculture, forestry, and suburban/urban areas. This greatly increases the effective water quality protection area for which LDEQ is either directly or indirectly responsible.

[1]https://www.census.gov/geo/reference/state-area.html:

Many Louisiana citizens depend on good water quality, not only for drinking water sources and consumptive/nonconsumptive recreation, but also for commercial purposes, and these activities produce revenue for the state through license sales. *The LDWF 2015-2016 Annual Report* (LDWF 2016) states that the agency issued 65,000 commercial fishing licenses, generating in excess of $4 million in revenue from license sales. Boat registration/title transactions for 2015-2016 numbered 220,000; bringing in over $4.7 million in revenue. Over 233,000 commercial fishing trips were reported, producing more than 155 million pounds of seafood. The total 2015 economic effect of the commercial fisheries industry in Louisiana was $2.1 billion (National Oceanic and Atmospheric Administration (NOAA) 2015).

LDWF also reports that the shrimp fishery is Louisiana's most valuable commercial fishery. Louisiana continued to lead the nation in shrimp landings with approximately 98 million pounds landed in 2013. The dockside value was about $178 million. Additionally, Louisiana blue crab landings for 2013 totaled 38.8 million pounds, bringing in $51 million dockside.

Louisiana regularly leads the U.S. in oyster production, averaging approximately 1/3 of the nation's oyster landings. Oysters routinely have a total annual economic impact on the Louisiana economy of roughly $300 million. In 2013, Louisiana provided over 11 million pounds of oysters, with a dockside value of more than $45 million (NOAA 2015). Louisiana consistently ranks #1 in landings among Gulf of Mexico states, bringing in over 50% of all oysters landed (LDWF 2012).

Louisiana's commercial crawfishing industry also depends on good water quality. The Louisiana State University (LSU) Agricultural Center estimates commercial harvest figures of $172 million for aquaculture crawfish and $14.3 million in wild-caught crawfish for 2014. Gross value of Louisiana aquaculture for 2014 was $293.8 million, reported by the LSU AgCenter. Fur animal and alligator harvesting also added $11 million to the 2014 total (LSU AgCenter 2014).

Recreational fishing made an important contribution to Louisiana's economy with a total 2013 economic impact of approximately $2.9 billion (NOAA 2015). In 2013-2014, anglers took over 5 million marine recreational fishing trips (LDWF 2014). A survey presented in the *2009-2013 Louisiana Statewide Comprehensive Outdoor Recreation Plan* revealed that "Fishing/Crabbing" was #1 out of the Top 10 2008 Important Outdoor Recreational Activities Among Households, and "Public Access to State Waters" was #4 (Louisiana Office of State Parks (LOSP) 2009).

Both recreational and commercial fishing have an obvious relationship to Louisiana's water resources. Not so obvious is the connection between high quality water resources and hunting/nonconsumptive wildlife activities. Hunting is popular in Louisiana, and it is widely acknowledged that terrestrial wildlife and especially waterfowl are dependent on the availability of high quality waters. A total of 191,300 deer hunters participated in hunting activities during the 2013-2014 deer season. There were also 77,600 duck hunters, 38,300 dove hunters, 1,100 quail hunters, 3,700 woodcock hunters, and 21,300 turkey hunters (LDWF 2014).

The total retail sales figure associated with hunting in Louisiana in 2011 was $564 million (U.S. Fish and Wildlife Service (USFWS) 2013). In 2011, an estimated 1,010,000 participants engaged in wildlife watching (nonconsumptive recreation), resulting in a total economic effect of $542.7 million to the state (USFWS 2013).

In 2006, the most recent year for which these figures are available, fishing, hunting, and wildlife activities generated an estimated $4.61 billion in retail sales, $6.75 billion in total economic effect, $446.2 million in state and local tax revenues, and supported 76,700 jobs after adjusting for

multiple counting of boat purchases (Southwick and Assoc. 2008). In fiscal year 2013/2014, LDWF sold more than 2.5 million recreational hunting, fishing, trapping, and nonconsumptive use licenses to more than 800,000 customers, generating in excess of $20 million in revenue (LDWF 2014).

The wildlife, fishing, and boating resources of Louisiana generate substantial economic benefits to state residents and to the common good. Industry investment in water pollution abatement capital expenditures and operating costs protects a multibillion-dollar industry. This financial outlay typically amounts to less than 10% of the value of the annual benefits. Moreover, hunters and nonconsumptive users alike are less likely to participate in their preferred activities in areas of questionable water and aesthetic quality. An all-encompassing approach to environmental and resource management requires that consideration be given to all wildlife, aquatic and terrestrial, because all require clean water for their survival. While the total contribution of fishing, hunting, and nonconsumptive recreation cannot be directly related to water resources, almost all of it can be associated with the need for clean water. In a 2005 survey of 403 Louisiana citizens by the Southeastern Association of Fish and Wildlife Agencies (SEAFWA), "Polluted water/water quality" was named the second most important fish and wildlife issue, led only by "Habitat loss" (SEAFWA 2005).

Clean water is also important to the tourism industry. Travel statistics indicate that 17% of resident visitors participate in some sort of outdoor activity during their visit, as do 6% of international visitors. The number of visitors statewide continues to exceed 2004 levels (pre-Hurricane Katrina), with 26.3 million people visiting the state in 2012 (Louisiana Office of Tourism (LOT) 2013). According to *The 2011 Louisiana Tourism Satellite Account (LTSA): An Update* (Terrell and Bilbo 2013), in 2011, tourists in Louisiana spent $10 billion, surpassing pre-Hurricane Katrina levels. Travel and tourism now account for 8.2% of state government revenues (Terrell and Bilbo 2013). Approximately 8% of the state workforce (147,000-plus people) work directly in the Louisiana travel industry; the LTSA report also states that 56,034 additional Louisiana jobs were created as an indirect effect of travel and tourism expenditures.

In FY 2014-15, approximately 1,898,618 visitors came to Louisiana State Parks and Historic sites (Louisiana Department of Culture Recreation and Tourism (LDCRT) 2016). State recreational areas cover over 1,510,298 acres. Out-of-state visitors to state parks spend almost $12 million in Louisiana annually. The Louisiana DCRT estimates that visitor spending at state parks returns $3.23 in state taxes for every dollar spent on park operation and maintenance (University of New Orleans (UNO), LSU, McNeese State University (MSU), Louisiana State University Shreveport (LSUS) 2006). In the LOSP *Strategic Plan for FY 14-15—18-19*, program objectives include sustaining the number of visitors served by the park system at an annual minimum of 2,200,000 by the end of FY 2018-2019, and sustaining a level of 175,000 individuals annually participating in interpretive programs and events by the end of fiscal year 2018-2019. LOSP has three strategies directly dependent on water quality to meet these objectives (LDCRT 2013):

- Strategy 2.1 – Maintain and operate all state park sites and facilities according to the highest national and international standards of quality
- Strategy 2.8 – Introduce new initiatives such as…the American Wetlands Program and participation in other tourism programs in order to further enhance visitation
- Strategy 2.17 – Increase the focus on native resources

For summaries of recent improvements to state parks, many involving waterfront and wetland sites, see the *2016 Sunset Report* (LDCRT 2016, 37-51).

There are also 23 National Wildlife Refuges in the state, all-encompassing some portion of Louisiana waterways. People use the U.S. Forest Service (USFS) refuges for hunting, fishing, birding, photography, and environmental education while spending money in localities near these sites. For more information on the USFS refer to: http://www.fws.gov/refuges/refugeLocatorMaps/Louisiana.html.

As one of the top five production destinations in the world, Louisiana is also seeing increasing economic benefit from the entertainment industry. According to an economic impact study commissioned by the Office of Entertainment Industry Development, Louisiana Department of Economic Development, more than $1.05 billion in sales were generated in Louisiana in 2014 from film and TV industry projects, and some of these productions utilized natural settings.[3] In 2013, 18 of the 108 major studio movies released in the U.S. had a significant number of their scenes shot in Louisiana. The Best Picture Oscar winner of 2013, *12 Years a Slave*, was filmed throughout rural south Louisiana. According to the LOSP (S. Broussard, pers. comm.), nine movies, seven documentaries, three TV shows, one TV movie, one TV pilot, and two music videos were filmed at State Parks sites in 2012-13, creating further national and international interest in Louisiana and its beautiful natural environment.

Although not all of Louisiana's outdoor recreational and scenic opportunities are water-based, water quality is an important consideration in the overall environmental perception of travelers. Because water quality often plays an important part in this recreation, it is imperative that it be enhanced and protected. Along with other quality-of-life parameters, environmental perception is a factor when Louisiana is contemplated as a place to relocate or start a business.

Louisiana invests a great deal of money in its efforts to enhance and maintain its water quality. In return, the citizens of Louisiana and visitors derive a number of benefits, both financial and aesthetic, from the state's abundance of water bodies. With the combined efforts of LDEQ, federal and state agencies, industry, and the citizens of Louisiana, our waters will continue to provide abundant recreational and commercial benefits for everyone.

[3] http://www.louisianaentertainment.gov/docs/default-source/default-library/2015_oeid_program_impact_report_final.pdf?sfvrsn=2

# PART III: SURFACE WATER MONITORING AND ASSESSMENT

## Chapter 1: Surface Water Monitoring Program

The surface water monitoring programs of the OEC of LDEQ are designed to provide data for the following objectives:

- Measure progress toward achieving water quality goals at state and national levels
- Establish and review the state water quality standards
- Determine the assimilative capacity of the waters of the state
- Establish permit limits for wastewater discharges

The surface water monitoring program is composed of an Ambient Water Quality Monitoring Network (AWQMN), intensive surveys, special studies, and wastewater discharge compliance sampling. Some components of the state water monitoring program are briefly described below.

### Ambient Water Quality Monitoring Network

The primary use of the data from the AWQMN is to determine if water quality standards are being attained. To accomplish this, core indicators are monitored and used to determine designated use support (Table 3.1.1). Data may also be used for/by other programs within LDEQ (e.g., standards/criteria determination, modeling, permitting, project planning) and external entities.

Data is collected systematically to obtain water quality monitoring data on selected water subsegments defined in the Surface Water Quality Standards (LAC 33:IX Chapter 11). The current approach to ambient surface water monitoring consists of a four-year rotating sampling plan with approximately one-fourth of the selected subsegments in the state sampled each year. Long-term monitoring sites are located in 10 of the 12 basins and will be sampled every year throughout the four-year cycle. Under this plan LDEQ conducts a complete census of selected subsegments identified in LAC 33:IX.1123, Table 3 during the four-year rotation. There are, however, some subsegments that are difficult to sample within the physical and time constraints imposed upon the regional staff. These difficult-to-monitor subsegments will be evaluated individually to determine what type of monitoring and assessment can best be performed to assess the water quality of that subsegment.

Beginning with the 2009-2010 AWQMN sample site rotation, the number of sites being sampled was reduced due to state budget constraints. As budget restrictions eased, LDEQ resumed AQWMN sampling at the level described in this report and the ambient monitoring QAPP.

Surveillance Division personnel conduct the AWQMN sampling. At each sampling site, the sample collector takes *in situ* field measurements and collects water samples for laboratory analysis for the parameters outlined in Table 3.1.1.

**Table 3.1.1**

**Designated uses for Louisiana water bodies and the core indicators used to determine water quality standards attainment**

| Designated Use | Core Indicators | Basis for Use Support Decision |
|---|---|---|
| Fish and Wildlife Propagation | Dissolved Oxygen (mg/L) (Routine grab ambient) | Percent exceedance[1] |
| | Dissolved Oxygen (mg/L) (Continuous Monitoring) | Percent exceedance[1] |
| | Temperature | Percent exceedance |
| | pH | Percent exceedance |
| | Chloride | Percent exceedance |
| | Sulfate | Percent exceedance |
| | Total Dissolved Solids | Percent exceedance |
| | Turbidity | Percent exceedance |
| | Toxic Substances | Less than two exceedances in three years[2] |
| | Metals | Less than two exceedances in three years[2] |
| Limited Fish and Wildlife Use | Dissolved Oxygen | Percent exceedance[1] |
| | Dissolved Oxygen (mg/L) (Continuous Monitoring) | Percent exceedance[1] |
| Primary Contact Recreation | Fecal Coliform | Percent exceedance |
| | Temperature | Percent exceedance |
| | Toxic Substances | Less than two exceedances in three years[2] |
| Secondary Contact Recreation | Fecal Coliform | Percent exceedance |
| | Toxic Substances | Less than two exceedances in three years[2] |
| Drinking Water Supply | Color | Percent exceedance |
| | Fecal Coliform | Percent exceedance |
| | Toxic Substances | Less than two exceedances in three years[2] |
| | Metals | Less than two exceedances in three years[2] |
| Outstanding Natural Resource Waters | Turbidity | Percent exceedance |
| Agriculture | None (indicated by support of other designated uses) | |
| Oyster Propagation | Fecal Coliform | Percent exceedance |

1. LDEQ's AWQMN Dissolved Oxygen (DO) routine grab samples are used as an initial screening for DO criteria assessments. In the event the criterion is not met, continuous monitoring for DO may be initiated.
2. LDEQ has adopted a screening approach for water quality assessment decisions based on metals and toxics (also referred to in this document as organic compounds) data.

The Water Quality Program management decisions are made from conclusions that are based on data. Therefore, it is imperative that water quality data be diligently managed in a structured database. Water quality monitoring data managed by the Water Planning and Assessment Division (WPAD) is stored in a set of related Oracle tables and referred to as the Louisiana Environmental

Assessment Utility (LEAU) database. Data management is accomplished through a variety of tools including Microsoft Access append and import queries, Microsoft Excel worksheets, and direct entry into Oracle tables through a Microsoft Access front end.

Data are collected or received for a variety of water quality monitoring projects including, but not limited to: 1) Ambient Water Quality Monitoring Network, 2) Mercury Contaminant Study, 3) Clean Metals sampling, 4) Calcasieu Toxics Study, 5) Nutrient Gradient Project, 6) TMDL studies, and 7) Ecoregion projects. Data management procedures will be followed for most water quality projects; should alternate data management procedures be required for a special project, those procedures may be outlined in a QAPP, an additional Standard Operating Procedure (SOP), or included in the next revision of the Data Management SOP as appropriate. Data submittals from some water quality monitoring projects, such as the Calcasieu Toxics Study, are no longer uploaded by the WPD, Water Quality Unit (WQU).

*In situ* water quality field data are recorded at the time of sample collection on the LDEQ Surface Water Quality Field Measurements form or the Ambient Water Quality Site Information Sheet. In addition to meter results, field data include date, collection time, sampling location, and collector's name. The Surveillance Division and Water Surveys Section staffs are responsible for submitting field data to the Louisiana Environmental Analytical Data Management System (LEADMS) and field records to LDEQ's Electronic Data Management System (EDMS). The WPD, WQU is responsible for transferring field data from LEADMS to the LEAU database.

Laboratories are required to produce analytical data narrative reports in PDF format and EDDs in the LEADMS format. The deliverables include analytes, sample date, methods of analysis, date of analyses, chemists performing the analyses, reporting limits, quality control information, and the results associated with the sample. EDDs and PDF reports are transmitted to LDEQ's Laboratory Contract Management Section by contract laboratories for initial quality control review and then forwarded to WPD, WQU in the form of emails. The WQU uploads the new data to LEAU after which WQU, Data Evaluation, Assessment and Reporting unit reviews the laboratory deliverables for quality assurance and either requests additional information from the laboratories or forwards the laboratory deliverables to WQU data management personnel for final data management in LEAU.

Data from the Ambient Water Quality Monitoring Network is sent to USEPA's Water Quality Exchange (WQX) annually for the period that was sampled two years prior to the submittal. It is extracted from LEAU and formatted, then uploaded to WQX through an Access program. Preparations are being made for this process to be submitted through the WQX node and the procedures will change when this is implemented.

## Mercury Monitoring Program / Fish Tissue Monitoring Activities

In July 2015 LDEQ began planning for a restart of its former mercury monitoring program for fish tissue. Funding for the restart was provided through a Beneficial Environmental Project (BEP) with a major electrical utility company. Sampling resumed on February 11, 2016 on Bayou Queue de Tortue in southwest Louisiana and will be conducted once each year at approximately 45-50 sites, beginning with those water bodies and sites where fish consumption advisories are currently in place. An additional three or four sites may be added each year as time and funding are available. These additional sites will be on water bodies where previous sampling indicated elevated levels

of mercury but concentrations were not sufficiently high to warrant an advisory. The project is scheduled to run through approximtely December 2019. Additional sampling will be conducted as funding permits.

Samples are composites of three to nine individual fish or in some cases a single large fish. Freshwater target species include largemouth bass (*Micropterus salmoides*), bowfin (*Amia calva*), flathead catfish (*Pylodictis olivaris*), freshwater drum (*Aplodinotus grunniens*), blue catfish (*Ictalurus furcatus*) , channel catfish (*I. punctatus*) and crappie (*Pomoxis sp.*). Other appropriate species include spotted bass (*Lepomis punctatus*), striped bass (*Morone saxatilis*), white bass (*M. chrysops*), buffalo (*Ictiobus sp.*), redear sunfish (*L.microlophus*), bluegill (*L. macrochirus*), and warmouth (*L. gulosus*). Saltwater targeted species are spotted seatrout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellatus*), southern flounder (*Paralichthys lethostigma*), red snapper (*Lutjanus campechanus*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*S. maculatus*), and other appropriate species when available.

Fish tissue analysis is done by the University of Louisiana Monroe, Environmental Analysis Laboratory. All sample results are forward to the LDH, Section of Environmental Epidemiology and Toxicology for risk assessment. LDH scientists determine the need for new, revised, or rescinded advisories and advise both LDEQ and the LDWF. Once the agencies concur with the LDH recommendations, new or revised advisories will be announced by press release and posted on the LDH and LDEQ websites.

More information on Louisiana's mercury monitoring program can be found at: http://deq.louisiana.gov/page/mercury-initiative. More information on Louisiana's fish tissue and advisory program can be found at: http://deq.louisiana.gov/page/fishing-consumption-and-swimming-advisories.

## Intensive Surveys and TMDL Studies

LDEQ plans to revise existing TMDLs for water bodies in systematically prioritized watersheds. Priority will be given to those water bodies that were listed as impaired in the most recently approved Integrated Report and included in Louisiana's priorities under the new CWA § 303(d) and TMDL Vision. In particular, this includes water bodies with existing TMDLs in which regulated point source discharges have been identified as the primary sources contributing to the impairment and there is a need for revision due to changes in criteria, loading, or other needed updates. Work will include the ongoing process of identifying water bodies meeting the noted criteria for revisions.

Surveys and laboratory analysis were previously conducted for the original TMDLs and should suffice for the revisions. However, additional survey work and data analysis may be required in some cases. These will be determined on a case-by-case basis. For each TMDL revision, work may include an evaluation and update of point source and nonpoint source loads in the watershed, updates to modeling and calculations based on new data, updates to the TMDL, and updates to the report. Critical stream conditions for flow, temperature, and dissolved oxygen may be updated based on new data.

The revisions are expected to be chosen from the following list of TMDL reports with priority for the current cycle being given to the first 3 reports.

- Bayou Manchac Watershed TMDL for Biochemical Oxygen-Demanding Substances-Phase I, Subsegment LA040201_00;
- Lower Amite River Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegment LA040303_00;
- Bayou Segnette TMDL for Biochemical Oxygen-Demanding Substances Subsegment LA020701_00;
- Grays Creek Watershed TMDL for Biochemical Oxygen-Demanding Substances, Subsegment LA040304_00;
- Colyell Creek Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegment LA040305_00;
- Lower Tchefuncte River Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegments LA040802_00 and LA040803_00;
- Bayou Liberty and Bayou Bonfouca Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegments LA040905_00, LA040906_00, LA040907_00, and LA040908_00;
- TMDL for Dissolved Oxygen for Ponchatoula Creek and Ponchatoula River (Subsegment LA040505_00) in the Lake Pontchartrain Basin, Louisiana;
- Selsers Creek Watershed TMDL for Biochemical Oxygen-Demanding Substances, Subsegment LA040603_00;
- Bayou Lacombe Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegments LA040901_00 and LA040902_00;
- Bayou Cane Watershed TMDL for Biochemical Oxygen-Demanding Substances – Phase I, Subsegments LA040903_00 and LA040904_00;
- TMDL For Dissolved Oxygen for Bayou Labranche (Subsegment LA041201_00) in the Lake Pontchartrain Basin, Louisiana;
- TMDL for Dissolved Oxygen for New Orleans East Leveed Water Bodies (Subsegment LA041401_00) in Lake Pontchartrain Basin, Louisiana; Or the TMDL for Dissolved oxygen for Violet Canal (Subsegment LA041805_00) in the Lake Pontchartrain Basin, Louisiana;
- TMDLs for Dissolved Oxygen and Nutrients for Bayou Lafourche Subsegment LA020401_00 in the Barataria Basin, Louisiana;
- Bayou Des Allemands TMDLs for Dissolved Oxygen and Nutrients, Subsegment LA020201_00;
- Bayou Des Allemands Watershed TMDL for Biochemical Oxygen-Demanding Substances, Subsegment LA020301_00;
- TMDLs for Dissolved Oxygen and Nutrients in Selected Subsegments in the Middle Terrebonne Basin, Louisiana (LA120202_00, LA120204_00, LA120304_00, LA120403_00, LA120604_00);
- TMDLs for Dissolved Oxygen and Nutrients in Selected Subsegments in the Upper Terrebonne Basin, Louisiana (LA120110_00, LA120102_00, LA120103_00, LA120105_00, LA120106_00, LA120107_00, LA120109_00).

## Special Studies

### Coastal Dissolved Oxygen Criteria Study

Proper levels of oxygen in our water bodies are necessary for the respiration of aquatic life. Although a primary constituent of water, the oxygen contained in a water molecule is unavailable to biota due to chemical bonding; it must be present in its dissolved atmospheric form ($O_2$) to be of use. The amount of dissolved oxygen (DO) that is needed can vary among organisms, their associated habitats, ecosystems, and regions. The concentration of DO present in a waterway depends on atmospheric and photosynthetic inputs, metabolism of aquatic biota, physical processes, and environmental variables.

The LDEQ sets DO criteria to insure protection of aquatic biota at all life stages via the Fish and Wildlife Propagation Use designation in accordance with Section 303(c) of the Clean Water Act. State wide criteria for DO in Louisiana were set forth in 1972 via a memo from the USEPA, were augmented with the publication of "*The Gold Book*" in 1986, and consist of minimum values of 5 mg/L for fresh and coastal marine waters and 4 mg/L for estuaries (USEPA, Busch to Lafleur 1972; *Quality Criteria for Water*, EPA 440/5-86-001, The Gold Book, USEPA 1986; LAC 33:IX.1113.C.3). At the onset, Louisiana voiced that many of its waterways had natural deviations from the recommended national criteria, and has continuously revised and promulgated new DO criteria though extensive processes— the most recent of which is outlined in this report (http://deq.louisiana.gov/page/eastern-lmrap-uaa-documents). The majority of marine and estuarine waters are, however, still defined by water quality criteria recommendations from over 40 years ago.

In an effort to update and refine DO criteria to reflect conditions present in Louisiana coastal waters, the LDEQ is evaluating USEPA and other state/regional approaches. New scientific methods and information, history of impairments, water quality data from various sources, and physical and environmental dynamics that may limit oxygen availability are being examined to insure that appropriate criteria are set by LDEQ for the protection of designated uses and impairment decisions. Estuarine and marine waters will be addressed together as coastal waters. Major study components have included the following:

- Approach determination for the development of revised coastal DO criteria: (1) laboratory generated concentration limits based on the acute, chronic, and recruitment sensitivity of select organisms to dissolved oxygen concentrations and (2) the use of natural conditions in un-impacted or least impacted locations to set appropriate criteria. Both of these procedures have been assessed, and the use of laboratory-defined concentrations have been determined to be most suitable for state coastal waters, primarily due to limited availability of least impacted conditions (mainly in the Mississippi and Atchafalaya river basins) and available resources. Preliminary analyses and endpoints have been completed for coastal waters (non-stratified), with the inclusion of up-to-date data from scientific literature.
- Historic DO impairments of Louisiana's coastal waters were reviewed for 14 years of data in relation to salinity regimes, TMDL's, and suspected natural conditions. The presence of these impairments in relation to potential revised criteria (non-stratified waters), the impact of promulgation of new criteria, and the effect on anti-degradation policy are under consideration.

Continued progress during the 2014-2016 Integrated Report period included:

- Submittal of LDEQ's conceptual approach for DO criteria revision, entitled '*Conceptual Approach to Revise Dissolved Oxygen Criteria in Louisiana's Stratified Coastal Waters*', to EPA on October 31, 2016.
- Literature review and summarization concerning past DO levels from proxies in sediments for coastal Louisiana waters.
- Data analyses and report generation from the 2014-2015 Coastal Louisiana Dissolved Oxygen Study.
- QAPP updates for the Coastal Louisiana Dissolved Oxygen Study concerning indirect data sources.
- Direct and Indirect data source justification, acquisition, and Quality Assurance/Quality Control (QA/QC) from a variety of programs that collected DO and other appropriate physical data within the water column (profile data).
- Indirect data source justification, acquisition, and QA/QC from a variety of programs that collected data that may provide insight to causation of low DO levels in Louisiana coastal waters, such as flow and nutrient data.

The revision of criteria for waters susceptible to low oxygen concentrations, i.e., stratified waters, is a major element of the study that is ongoing. An integrated approach, utilizing focal species, life history parameters, USEPA methodology, and laboratory and field DO sensitivity values is under development. A potential ecological component for criteria end points will also be evaluated.

## Total Maximum Daily Load Development Program

### Total Maximum Daily Load Status

Following completion of the consent decree commitments, ongoing TMDL development has been focused on revising existing dissolved oxygen TMDLs where the criteria have been revised. TMDL progress is shown in Table 3.1.2. More information on USEPA's TMDL program can be found at: http://www.epa.gov/tmdl.

In addition, LDEQ continues activities to prioritize work in accordance with the "Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act § 303(d) Program." More information on this vision can be obtained at:
http://deq.louisiana.gov/page/clean-water-act.

**Table 3.1.2**

**Louisiana Department of Environmental Quality Total Maximum Daily Load progress from January 01, 2014 to December 31, 2015.**

| Revised TMDLs Developed by LDEQ and Approved by USEPA | | | | | |
|---|---|---|---|---|---|
| **Water Body** | **Subsegment Number** | **Basin** | **Date Finalized** | **TMDL Parameters** | **TMDL Status** |
| Lower Grand/Belle River | 120201 | Terrebonne | 9/23/2014 | Dissolved Oxygen/ Nutrients | Final |
| Bayou Terrebonne | 120301 | Terrebonne | 11/23/2015 | Dissolved Oxygen/ Nutrients | Final |
| Bayou L'eau Bleu | 120303 | Terrebonne | 10/20/2016 | Dissolved Oxygen/ Nutrients | Final |

# Chapter 2: Water Quality Assessment Methods and Integrated Report Rationale

## Introduction

### Statutes and Regulations

The LDEQ prepared reports to meet the requirements outlined in § 303(d) and § 305(b) of the federal Water Pollution Control Act (United States Code, Title 33, §1251 et seq., 1972) (commonly known as the Clean Water Act) and supporting federal regulations found in Title 40 of the Code of Federal Regulations, Parts 130.7 and 130.10 (40 CFR 130.7, 130.10). Section 303(d) of the CWA and supporting regulations require each state to identify water quality-limited segments (i.e., Louisiana subsegments that do not meet water quality standards) requiring development of TMDLs and to prioritize the water quality-limited segments for TMDL development. States are required to assemble and evaluate existing and readily available water quality-related data and information to develop the list. Additionally, each state must provide documentation to support listing decisions, including: a description of the method used to develop the list; a description of the data and information used to identify (i.e., list) waters; a rationale for any decision not to use existing and readily available data and information; and other information to demonstrate "good cause" for not including waters on the § 303(d) list pursuant to 40 CFR 130.7(b)(6).

Section 305(b) of the CWA and supporting regulations require states to report on the quality of state waters every two years; the biennial reports are due April 1 of even-numbered years. Section 305(b) requires a description of all navigable waters in each state and the extent to which these waters provide for the protection and propagation of fish and wildlife and allow for recreational activities in and on the water.

### Guidance

The United States Environmental Protection Agency issues guidance for the assessment, listing, and reporting of states' water quality to meet the requirements of CWA § 303(d) (impaired waters list) and § 305(b) (water quality inventory) (USEPA various dates). USEPA guidance outlines the compilation and reporting of state water quality in a combined report—the Integrated Report (IR). USEPA's guidance further outlines the use of categories to classify the quality of watersheds in each state. Integrated Report categories are outlined in Table 3.2.1.

## Integrated Report Development

The 2018 IR contains new assessments for subsegments in all 12 Louisiana basins: Atchafalaya (01), Barataria (02), Calcasieu (03), Pontchartrain (04), Mermentau (05), Vermilion/Teche (06), Mississippi (07), Ouachita (08), Pearl (09), Red (10), Sabine (11), and Terrebonne (12). Due to the four-year cyclical nature of LDEQ's Ambient Water Quality Monitoring Network approximately ½ of the assessments for the 2018 IR will be new, while the remaining ½ will be carried forward from the 2016 IR. Data from October 1, 2013 through September 30, 2017 were used for the 2018 IR.

**Table 3.2.1.**

U.S. Environmental Protection Agency Integrated Report Methodology guidance categories used to categorize water body/impairment combinations for the *Louisiana 2018 Integrated Report*; includes IRC 5RC and IRC 5-Alt developed by LDEQ and approved by U.S. Environmental Protection Agency.

| IR Category (IRC) | IR Category Description |
|---|---|
| IRC 1 | *Specific Water body Impairment Combination* (WIC) cited on a *previous* § 303(d) list is now attaining all uses and standards. Also used for water bodies fully supporting all designated uses. |
| IRC 2 | Water body is meeting some uses and standards but there is insufficient data and/or information to determine if uses and standards *associated with the specific WIC* cited are being attained. |
| IRC 3 | There is insufficient data and/or information to determine if uses and standards *associated with the specific WIC* cited are being attained. |
| IRC 4a | WIC exists and a TMDL was completed for the *specific WIC* cited. |
| IRC 4b | WIC exists and control measures other than a TMDL are expected to result in attainment of designated uses *associated with the specific WIC* cited. |
| IRC 4c | WIC exists and a pollutant (anthropogenic source) does not cause the *specific WIC* cited. |
| IRC 5 | WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited. **IRC 5 and its subcategories represent Louisiana's § 303(d) list.** |
| IRC 5RC (Revise Criteria) | WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited; however, LDEQ will investigate revising criteria due to the possibility that natural conditions may be the source of the water quality criteria impairments. |
| IRC 5- Alt (5-Alternative) | WIC exists for one or more uses and a TMDL is required for the *specific WIC* cited; however, LDEQ will implement alternative strategies under its § 303(d)/Vision process to ensure the water body will meet water quality standards in the future. |

## Water Quality Assessment Methods

The following outlines the methods LDEQ used to develop the CWA § 303(d) list and water body categorizations found in the 2018 IR. LDEQ used assessment procedures developed and updated over a number of years. Procedures followed USEPA guidance documents for § 305(b) reports and § 303(d) lists and USEPA's Consolidated Assessment and Listing Methodology (CALM) guidance (USEPA various dates). LDEQ based water quality assessments and § 303(d) listings on

specific water body subsegments as defined in Louisiana's Surface Water Quality Standards (LAC 33:IX.1101-1123). Louisiana surface water quality standards define eight designated uses for surface waters: primary contact recreation (PCR), secondary contact recreation (SCR), fish and wildlife propagation (FWP) (with "subcategory" of limited aquatic and wildlife use (LAL)), drinking water supply (DWS), oyster propagation (OYS), agriculture (AGR), and outstanding natural resource waters (ONR). Designated uses have specific suites of ambient water quality parameters used to assess their support. Links between designated uses and water quality parameters, as well as water quality assessment procedures, can be found in Table 3.2.2. Additional details of Louisiana's IR assessment process can be found in Louisiana's Standard Operating Procedures for Production of Water Quality IR (LDEQ 2017a).

## Water Quality Data and Information

LDEQ prepared assessments using existing and readily available water quality data and information in order to comply with rules and regulations under § 303(d) of the CWA (33 U.S. Code §1313 and 40 CFR 130.7). LDEQ used monitoring procedures and data for the 2018 IR that remained essentially the same as those used to collect data for the 2016 IR.

LDEQ primarily relied on data and information supplied through LDEQ's routine ambient monitoring program to conduct water quality assessments for the 2018 IR. LDEQ conducts monitoring on nearly all water quality subsegments on a four-year statewide monitoring cycle. Approximately one-quarter of the state's subsegments are monitored each year; a limited number of subsegments are monitored (and continue to be monitored) every year (i.e., long-term monitoring stations). Each monitoring cycle or "water-year" begins in October and ends in September of each year; concluding the monitoring cycle in September allows time to process data and generate the IR by April 1 of even-numbered years. LDEQ collected monthly and quarterly (organics) water quality data (LDEQ 2015; LDEQ 2017a; LDEQ 2017b; LDEQ 2017c; LDEQ 2018a) ambient water quality data are available on LDEQ's website at: http://deq.louisiana.gov/page/ambient-water-quality-monitoring-data.

LDEQ compiled and assessed data from the AWQMN collected between October 1, 2013 and September 30, 2017; up to four years (48 samples) of data were available for subsegments with long-term monitoring sites (LDEQ 2017a; LDEQ 2017b).

**Table 3.2.2.**

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2018 Integrated Report.*[1]

| Designated Use | Measured Parameter | Support Classification for Measured Parameter | | |
|---|---|---|---|---|
| | | **Fully Supporting** | **Partially Supporting[2]** | **Not Supporting** |
| Primary Contact Recreation (PCR) (Designated swimming months of May-October, only) | Fecal coliform[3] | 0-25% do not meet criteria | - | >25% do not meet criteria |
| | Enterococci[4] | 0-10% of single exceedances do not meet criteria; rolling three-month geometric mean ≤ 35 cfu/100 mL | - | >10% of single exceedances do not meet criteria; rolling three-month geometric mean > 35 cfu/100 mL |
| | Temperature | 0-30% do not meet criteria | >30-75% do not meet criteria | >75% do not meet criteria |
| | Metals[5,6,7] and Toxics | <2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters | - | ≥2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters |
| Secondary Contact Recreation (SCR) (All months) | Fecal coliform[3] | 0-25% do not meet criteria | - | >25 % do not meet criteria |
| | Metals[5,6,7] and Toxics | <2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters | - | ≥2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters |

**Table 3.2.2.**

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2018 Integrated Report.*[1]

| Designated Use | Measured Parameter | Support Classification for Measured Parameter | | |
|---|---|---|---|---|
| | | **Fully Supporting** | **Partially Supporting[2]** | **Not Supporting** |
| Fish and Wildlife Propagation (FWP) | Dissolved oxygen (routine ambient monitoring data)[8] | 0-10% do not meet criteria | >10-25% do not meet criteria | >25% do not meet criteria |
| | Dissolved oxygen (follow-up continuous monitoring data, if needed)[8] | 0-10% do not meet criteria | >10-25% do not meet criteria | >25% do not meet criteria |
| | Temperature, pH, chloride, sulfate, TDS, turbidity | 0-30% do not meet criteria | >30-75% do not meet criteria | >75% do not meet criteria |
| | Metals[5,6,7] and Toxics | <2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters | - | ≥2 exceedances of chronic or acute criteria in most recent consecutive 3-year period, or 1-year period for newly tested waters |

**Table 3.2.2.**

Decision process for evaluating use support, showing measured parameters for each designated use; Louisiana's *2018 Integrated Report.*[1]

| Designated Use | Measured Parameter | Support Classification for Measured Parameter | | |
|---|---|---|---|---|
| | | **Fully Supporting** | **Partially Supporting[2]** | **Not Supporting** |
| Drinking Water Source (DWS) | Color | 0-30% do not meet criteria | >30-75% do not meet criteria | >75% do not meet criteria |
| | Fecal coliform[3] | 0-30% do not meet criteria | - | >30 % do not meet criteria |
| | Metals[5,6,7] and Toxics | <2 exceedances of drinking water criteria in most recent consecutive three-year period, or one-year period for newly tested waters | - | ≥2 exceedances of drinking water criteria in the most recent consecutive three-year period, or one-year period for newly tested waters |
| Outstanding Natural Resource Waters (ONR) | Turbidity | 0-10% do not meet criteria | >10-25% do not meet criteria | >25% do not meet criteria |
| Agriculture (AGR) | None | - | - | - |
| Oyster Propagation (OYS) | Fecal coliform[3] | Median fecal coliform ≤ 14 MPN/100 mL; and ≤ 10% of samples > 43 MPN/100 mL | - | Median fecal coliform > 14 MPN/100 mL; and > 10% of samples > 43 MPN/100 mL |
| Limited Aquatic and Wildlife (LAL) | Dissolved oxygen[8] | 0-10% do not meet criteria | >10-25% do not meet criteria | >25% do not meet criteria |

## Footnotes to Table 3.2.2

1. Where deviations from the decision process described in Table 3.2.2 occur, detailed information will be given to account for and justify those deviations. For instance, circumstances that may not be accounted for in the plain electronic analysis of the data will be explored and may be used to either not list the water body or to put the Water body Impairment Combination (WIC) into a different category. Those circumstances will be fully articulated.
2. While the assessment category of "Partially Supporting" is included in the statistical programming, any use support failures will be recorded in ATTAINS as "Not Supporting." This procedure was first adopted for the 2002 § 305(b) cycle because "partially supported" uses receive the same TMDL treatment as "not supported" uses.
3. For most water bodies, criteria are as follows: PCR, 400 colonies/100 mL; SCR, 2,000 colonies/100 mL; DWS, 2,000 colonies/100 mL; OYS, 43 colonies/100 mL (see LAC 33:IX.1123).
4. For enterococci, Louisiana Department of Health (LDH's) single sample criterion for beach monitoring is 130 colony forming units (cfu)/100 mL. For marine waters, the geometric mean criterion over the period of record is 35 cfu/100 mL. LDH beach data only applies to the LDH monitored beaches. Refer to page 15 for details.
5. Determination of the application of marine or freshwater metals criteria is made based on LAC 33:IX.1113.C.6.d.
6. Parameters collected quarterly (metals and organics) require a minimum of three samples.
7. Ultra-clean metals sampling was discontinued in March 2015 due to lack of funding. It may be resumed in the future, if additional funding and personnel become available. Assessment methods for metals results remain in Table 3.2.2 in the event metals sampling is resumed in the future (LDEQ 2015).
8. In the event that analysis of routine ambient monitoring data for dissolved oxygen results in partial- or non-support, continuous monitoring (CM) data, where available, was used for follow-up assessment. CM data runs were approximately 48-72 hours in duration. CM data was evaluated as follows: All of the 15-minute interval dissolved oxygen observations from a CM sample run were analyzed to determine if more than 10% of the data points were below minimum criteria. Water bodies that fell below the criteria greater than 10% of the time were reported as IRC 5 and are therefore on the § 303(d) list. Water bodies that fell below the criteria less than or equal to 10% of the time were placed in IRC 1, fully supported. If ambient monitoring indicated impairment and CM data was not available for analysis, the water body was placed in IRC 5 until CM data can be collected during the critical season of May 1 through October 31. In some cases, CM data was not collected because it was determined by LDEQ headquarters and regional staff that CM data collection efforts were not warranted due to conditions in the field.

## Subsegments with Downstream or Upstream Monitoring Sites

LDEQ used ambient monitoring data and information collected from within or immediately downstream or upstream of a water body subsegment to evaluate each of the subsegment's designated uses, using the assesment decision processes shown in Table 3.2.2. Six subsegments used for the 2018 IR had sites less than 0.6 miles downstream or upstream of the subsegment boundary; in each case there were no known inputs between the subsegment boundary and the sample site. Three subsegments had sample points between one and two miles upstream or downstream from the subsegment boundary. Two subsegments had sites located in the coastal waters with open water between the subsegment boundary and the sample site. One subsegment had a sample point 6.7 miles downstream. In each case, there were no reasonable alternatives for sampling within the subsegment boundary, and each site was determined to be representative of the assessed subsegment.

## Subsegments with Long-Term Monitoring Sites

LDEQ collected data at 21 sites in subsegments with long-term monitoring stations. LDEQ applied assessments for a monitoring station indicating use impairment to the entire subsegment, even if the second monitoring station did not indicate use impairment.

## Metals

Ultra-clean metals sampling was discontinued in March 2015 due to lack of funding. It may be resumed in the future, if additional funding and personnel become available. Assessment methods for metals results remain in Table 3.2.2 in the event metals sampling is resumed in the future (LDEQ 2015).

## Dissolved Oxygen

Beginning in 2008, LDEQ from time to time collected two sets of data to conduct DO assessments. If routine ambient monitoring DO data indicate potential impairment of the use, LDEQ may collect and use continuous monitoring DO data sets to make a final determination on use support. Continuous monitoring data allows evaluation of the 24-hour diurnal DO fluctuations and an improved determination of whether the frequency of DO exceedances is impairing the use (LDEQ 2008). Deployment of continuous monitors was also dependent on available resources and a determination of whether collecting the extra data set was appropriate (e.g., if stream impairment was already known, there was no benefit to be gained by deploying a continuous monitor until additional pollution control measures were implemented). In some cases it was determined that conditions in the water body were severly impacted by drought or other natural or anthropogenic conditions. If such conditions were considered severe enough, it was determined the subsegment would be unable to attain DO criteria even with the use of continuous monitoring. In these cases continuous monitors were not deployed in order to reduce costs and eliminate risk to equipment.

For water quality data used in the 2018 IR a total of 27 dissolved oxygen continous monitoring runs were conducted following DO grab samples from the ambient water quality monitoring program. These covered 23 different subsegments. There were no changes in the initial DO assessments for any of the affected subsegments. Eight subsegments remained fully supporting the DO criterion and fifteen subsegments remained impaired for low DO.

## Coastal Subsegments with Shared Monitoring Sites

Beginning in 2010 LDEQ evaluated coastal subsegments for the potential to have shared data points for contiguous and similar subsegments. This was done to address subsidence and other land-altering activities that created open water areas between subsegments that were previously separated by land. Paired and/or adjacent subsegments were sampled on an alternating basis (one subsegment sampled one month, the paired subsegment sampled the next month) beginning in the 2010/2011 ambient monitoring cycle (Table 3.2.3). For the 2016 IR, all historical data for each site/subsegment for dissolved oxygen, turbidity, pH, temperature, salinity, alkalinity, and hardness and all fecal data from 2004 to present was analyzed to determine which sites/subsegments were not significantly different statistically and, therefore, could be combined for assessment purposes. For the 2018 IR additional statistical analyses were conducted to verify if combining data from the paired subsegments remained a valid option. These additional analyses used seasonal blocking and employed power and effect analysis. Table 3 shows the results of 2018 analyses. Where sites were statistically similar, data from both sites were combined and conventional assessment protocols found in Table 3.2.2 were used for assessment. Assessment results are found in Table 3.2.4. Where sites were not similar, data from each site was assessed separately with results again presented in Table 3.2.4. Additional information on the statistical approachs used to determine the suitability of combining sites is available upon request.

**Table 3.2.3.**

List of paired coastal subsegments/sites used for shared water quality monitoring and assessment.

| Subsegment | Site | Suitability of Combining Sites | Subsegment | Site | Suitability of Combining Sites |
|---|---|---|---|---|---|
| 010901<br>061002 | 1204<br>0692 | Can be combined | 042205<br>042206 | 1088<br>1087 | Can be combined |
| 041701<br>041704 | 0035<br>1072 | Not enough samples for comparison; potential differences | 060803<br>060804 | 0678<br>0679 | Can be combined |
| 042104<br>042102 | 0007<br>1080 | Should not be combined; significant differences between sites | 061104<br>061001 | 0316<br>0691 | Should not be combined; significant differences between sites |
| 042201<br>042202 | 1090<br>1082 | Should not be combined; potential differences | 110303<br>110304 | 1158<br>1159 | Should not be combined; significant differences between sites |
| 042203<br>042204 | 1089<br>1091 | Can be combined | 120406<br>120708 | 0937<br>0955 | Not enough samples for comparison; potential differences |
| 042207<br>042208 | 1083<br>0006 | Not enough samples for comparison; potential differences | 120802<br>120804<br>120803 | 0958<br>0960<br>0959 | Should not be combined; significant differences between sites |

**Table 3.2.4.**

Combined assessments for selected parameters for coastal subsegments with shared ambient monitoring sites. Percentages indicate percent of samples failing to meet the criterion.
(FS = Fully Supported; NS = Not Supported; AI = Assessed Independently)

| Subsegment | Site | Dissolved Oxygen | Fecal PCR | Fecal SCR | Fecal OYS | Enterococci PCR[2] | pH | Turbidity | Temperature |
|---|---|---|---|---|---|---|---|---|---|
| 010901 | 1204 | 0% FS | 33.3%; however, PCR N/A[1] | 16.7% FS | 50% NS | No Data | 0% FS | --[3] | 0% FS |
| 061002 | 0692 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 83.3% NS | No Data | 0% FS | --[3] | 0% FS |
| **Combined Assessment** | | **FS** | **N/A[1]** | **FS** | **NS** | **No 2018 IR enterococci assessment** | **FS** | **--[3]** | **FS** |
| 041701 | 0035 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | N/A[4] | No Data | 0% FS | 16.7% FS | 0% FS |
| 041704 | 1072 | 0% FS | 0% FS | 0% FS | N/A[4] | N/A | 0% FS | --[3] | 0% FS |
| **Combined Assessment** | | **AI** | **AI** | **AI** | **AI** | **No 2018 IR enterococci assessment** | **AI** | **AI** | **AI** |

**Table 3.2.4.**

Combined assessments for selected parameters for coastal subsegments with shared ambient monitoring sites. Percentages indicate percent of samples failing to meet the criterion.
(FS = Fully Supported; NS = Not Supported; AI = Assessed Independently)

| Subsegment | Site | Dissolved Oxygen | Fecal PCR | Fecal SCR | Fecal OYS | Enterococci PCR[2] | pH | Turbidity | Temperature |
|---|---|---|---|---|---|---|---|---|---|
| 042102 | 1080 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | 0% FS | 0% FS |
| 042104 | 0007 | 0% FS | 0% FS | 0% FS | 0% FS | N/A | 16.7 (high pH) FS | --[3] | 0% FS |
| **Combined Assessment** | | **AI** | **AI** | **AI** | **AI** | **No 2018 IR enterococci assessment** | **AI** | **AI** | **AI** |
| 042201 | 1090 | 0% NS[5] | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| 042202 | 1082 | 0% NS[5] | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| **Combined Assessment** | | **AI[5]** | **N/A[1]** | **AI** | **AI** | **No 2018 IR enterococci assessment** | **AI** | **--[3]** | **AI** |

**Table 3.2.4.**

Combined assessments for selected parameters for coastal subsegments with shared ambient monitoring sites. Percentages indicate percent of samples failing to meet the criterion.
(FS = Fully Supported; NS = Not Supported; AI = Assessed Independently)

| Subsegment | Site | Dissolved Oxygen | Fecal PCR | Fecal SCR | Fecal OYS | Enterococci PCR[2] | pH | Turbidity | Temperature |
|---|---|---|---|---|---|---|---|---|---|
| 042203 | 1089 | 0% NS[5] | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| 042204 | 1091 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| **Combined Assessments** | | **042203-NS[5] 042204-FS** | **N/A[1]** | **FS** | **FS** | **No 2018 IR enterococci assessment** | **FS** | **--[3]** | **FS** |
| 042207 | 1083 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| 042208 | 0006 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| **Combined Assessments** | | **AI** | **N/A[1]** | **AI** | **AI** | **No 2018 IR enterococci assessment** | **AI** | **--[3]** | **AI** |

**Table 3.2.4.**

Combined assessments for selected parameters for coastal subsegments with shared ambient monitoring sites. Percentages indicate percent of samples failing to meet the criterion.
(FS = Fully Supported; NS = Not Supported; AI = Assessed Independently)

| Subsegment | Site | Dissolved Oxygen | Fecal PCR | Fecal SCR | Fecal OYS | Enterococci PCR[2] | pH | Turbidity | Temperature |
|---|---|---|---|---|---|---|---|---|---|
| 042205 | 1088 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| 042206 | 1087 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| **Combined Assessments** | | **FS** | **N/A[1]** | **FS** | **FS** | **No 2018 IR enterococci assessment** | **FS** | **--[3]** | **FS** |
| 060803 | 0678 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | N/A[4] | No Data | 0% FS | 66.7% NS | 0% FS |
| 060804 | 0679 | 16.7% NS but combined is FS | 0%; however, PCR N/A[1] | 0% FS | N/A[4] | No Data | 0% FS | 50% NS | 0% FS |
| **Combined Assessments** | | **FS** | **N/A[1]** | **FS** | **N/A[4]** | **No 2018 IR enterococci assessment** | **FS** | **NS** | **FS** |

**Table 3.2.4.**

Combined assessments for selected parameters for coastal subsegments with shared ambient monitoring sites. Percentages indicate percent of samples failing to meet the criterion.
(FS = Fully Supported; NS = Not Supported; AI = Assessed Independently)

| Subsegment | Site | Dissolved Oxygen | Fecal PCR | Fecal SCR | Fecal OYS | Enterococci PCR[2] | pH | Turbidity | Temperature |
|---|---|---|---|---|---|---|---|---|---|
| 061001 | 0691 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| 061104 | 0316 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 16.7% NS | No Data | 0% FS | --[3] | 0% FS |
| **Combined Assessments** | | **AI** | **N/A[1]** | **AI** | **AI** | **No 2018 IR enterococci assessment** | **AI** | **--[3]** | **AI** |
| 110303 | 1158 | 0% FS | 16.7%; however, PCR N/A[1] | 0% FS | 25% NS | No Data | 0% FS | 8.3% FS | 0% FS |
| 110304 | 1159 | 0% FS | 16.7%; however, PCR N/A[1] | 8.3% FS | 41.7% NS | No Data | 0% FS | 8.3% FS | 0% FS |
| **Combined Assessments** | | **AI** | **N/A[1]** | **AI** | **AI** | **No 2018 IR enterococci assessment** | **AI** | **AI** | **AI** |

**Table 3.2.4.**

Combined assessments for selected parameters for coastal subsegments with shared ambient monitoring sites. Percentages indicate percent of samples failing to meet the criterion.
(FS = Fully Supported; NS = Not Supported; AI = Assessed Independently)

| Subsegment | Site | Dissolved Oxygen | Fecal PCR | Fecal SCR | Fecal OYS | Enterococci PCR[2] | pH | Turbidity | Temperature |
|---|---|---|---|---|---|---|---|---|---|
| 120406 | 0937 | 0% FS | 0% FS | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| 120708 | 0955 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 16.7% NS | No Data | 0% FS | --[3] | 0% FS |
| **Combined Assessments** | | **AI** | **AI** | **AI** | **AI** | **No 2018 IR enterococci assessment** | **AI** | **AI** | **AI** |
| 120802 | 0958 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| 120803 | 0959 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| 120804 | 0960 | 0% FS | 0%; however, PCR N/A[1] | 0% FS | 0% FS | No Data | 0% FS | --[3] | 0% FS |
| **Combined Assessments** | | **AI** | **N/A[1]** | **AI** | **AI** | **No 2018 IR enterococci assessment** | **AI** | **--[3]** | **AI** |

1. Fecal coliform data available but criteria do not apply during swimming season of May-October. Enterococci criteria apply during the swimming season. (LAC 33:IX.1113.C.5.a).
2. Enterococci criteria apply only to selected subsegments during swimming season of May-October LAC 33:IX.1123 (Table 3).
3. There is no turbidity criterion for these subsegments.
4. No oyster propagation use for this subsegment (LAC 33:IX.1123 (Table 3).
5. Dissolved oxygen fully supported based on LDEQ data but impaired based on third-party data.

## Assessment of Wetlands Approved for Wastewater Assimilation Projects

LDEQ compiled and assessed data from the Annual Wetland Monitoring Reports received from 2012 to 2016, which are prepared by the permitted dischargers approved for wastewater assimilation projects as a requirement of the LPDES Permit Program.

The annual wetland monitoring data was compiled for the reporting period of 2012 to 2016, representing the most recent complete five-year period as of the end of 2017 (2017 data is expected to be submitted by permittees in 2018). In review of the data, any quality issues identified, such as incorrect units or suspect extreme values, were communicated to the permittee and updated information was resubmitted by the permittee to LDEQ. Original and updated annual wetland monitoring reports submitted by the permittees are contained in EDMS under the appropriate wastewater permittees agency interest number (LDEQ 2018b).

The criteria for assessment of biological integrity for wetlands approved for wastewater assimilation projects (LAC 33:IX.1113.12.b) (LDEQ 2016b) is no more than a 20% reduction in the rate of total above-ground wetland productivity over a five-year period as compared to a reference area. The total above-ground productivity or net primary productivity is the sum of the perennial (stem growth) and ephemeral (litterfall) productivity for forested sites, and is the ephemeral (end-of-season live biomass) productivity for marsh sites. The Near site (which is the site in the discharge area closest to point of effluent addition) and the Reference site (site that is not within the discharge area) for the same wetland type of forested or marsh are used in this assessment. If a Near site was not available, in some cases a Mid site was used, if it was considered representative of the discharge area and effluent addition. The following assessments only address the designated use of fish and wildlife propagation.

The following assessment process was performed for the assessment:*

1. Compile the productivity data for the determined five-year period for the Near, or in some cases Mid, site and the Reference site for the same wetland type for each assimilation wetland project.
2. Determine the total above-ground wetland productivity (NPP) at the Near, or in some cases Mid, site and Reference site for the same wetland type for each assimilation wetland project.
    a. For a Forest Wetland site, sum the mean perennial productivity (PP) and ephemeral productivity (EP) for each year to determine each annual NPP (Equation 1)

        Equation 1: $NPPForest = PP + EP$

        Results for a Forest site will include an NPP Forest value for each year (Yr1, Yr2, Yr3, Yr4, and Yr5) over the five-year period where data is available.

    b. For a Marsh Wetland site, determine the mean end-of-season live biomass (EOSL) for each year to determine mean annual NPP (Equation 2).

        Equation 2: $NPPMarsh = EOSL$

        Results for a Marsh site will include an NPP Marsh value for each year (Yr1, Yr2, Yr3, Yr4, and Yr5) over the five-year period where data is available.

3. If multiple Forest, Marsh or Reference sites are available for an assimilation area, then the average percent change for the sites is used for the assessment.
    a. Calculate the year-to-year percent change for each site.
    b. Calculate the average of year-to-year percent changes for the combined sites.
4. If a near site is not available, then the next closest site is used for the comparison to the Reference site.
5. For each year-to-year comparison is there a reduction in growth at the Test Site as indicated by a negative growth percentage?
    a. No (e.g., ≥ 0% growth) – **Not impaired for that year-to-year comparison**
    b. Yes (e.g., < 0% growth)
        i. Is there a reduction or increase at the Reference Site?
            1. Reference Site Reduction – Is the Test Site reduction less than the Reference Site reduction?
                a. Yes (e.g., Reference Site -30% and Test Site -10% = Lower rate of reduction at Test Site – **Not impaired for that year-to-year comparison**
                b. No – See next step
            2. Reference Site Reduction – Is the Test Site reduction more than 20 percentage points less than the Reference Site reduction?
                a. Yes (e.g., Reference Site -5% and Test Site -30% = 25 percentage points (>20%) reduction below Reference Site) – **Impaired for that year-to-year comparison**; also,
                b. No (e.g., Reference Site -5% and Test Site -20% = 15 percentage points (<20%) reduction below Reference Site) – **Not impaired for that year-to-year comparison**
            3. Reference Site Increase – Is the Test Site reduction more than 20 percentage points less than the Reference Site increase?
                a. Yes (e.g., Reference Site +5% and Test Site -20% = 25 percentage points (>20%) reduction below Reference Site) – **Impaired for that year-to-year comparison**
                b. No – (e.g., Reference Site +5% and Test Site -10% = 15 percentage points (<20%) reduction below Reference Site) – **Not impaired for that year-to-year comparison**

6. Over the five-year period, how many year-to-year impairments occurred?
    c. One year-to-year impairment – **Not impaired for the IR assessment**
    d. Two or more year-to-year impairments – **Impaired for the IR assessment** and request further investigation by the facility to determine possible cause for the reduction in growth.

* The process described above is different from the one originally provided in the public notice Rationale for the 2018 IR. The new process was developed during discussions with USEPA and is based on comments provided by USEPA and Gulf Restoration Network.

Wetland assimilation project subsegments reported as impaired for fish and wildlife propagation have been placed in IR category 4b. Refer to page 144 for further documentation of this determination. Table 3.2.5 shows the 2018 Water Quality Integrated Report assessments for wetland assimilation projects and the associated subsegments.

**Table 3.2.5.**

Water quality assessments for fish and wildlife propagation (FWP) for subsegments designated as wetland assimilation areas in LAC 33:IX.1123. Table 3.

| Luling Wetland, Luling (LA020303_001) | | | | |
|---|---|---|---|---|
| **Forested Site[1]** | | | | |
| **Year** | **Site** | **% Change Near Test Site** | **% Change Reference Site (4629)** | **Assessment of Year-to-Year Support** |
| 2012 to 2013 | 4626 | 2.1% | -20.2% | Meet - Positive growth at test site |
| 2013 to 2014 | 4626 | 129.3% | 72.6% | Meet - Positive growth at test site |
| 2014 to 2015 | 4626 | -24.3% | -22.0% | Meet - Test percent loss is within 20 percentage points of reference site |
| 2015 to 2016 | 4626 | 6.0% | 22.0% | Meet - Positive growth at test site |
| | | | | **No annual failures over four years - Supports FWP** |

**Table 3.2.5.**

Water quality assessments for fish and wildlife propagation (FWP) for subsegments designated as wetland assimilation areas in LAC 33:IX.1123. Table 3.

| South Slough Wetland, Hammond (LA040604_001) | | | | |
|---|---|---|---|---|
| **Forested Mid-Site[1]** | | | | |
| **Year** | **Site** | **% Change Near Test Site** | **% Change Reference Site (4637)** | **Assessment of Year-to-Year Support** |
| 2012 to 2013 | 4635 | -22.1% | 16.9% | Fail - Test percent loss >20 percentage points below reference site |
| 2013 to 2014 | 4635 | 3.0% | 40.4% | Meet - Positive growth at test site |
| 2014 to 2015 | 4635 | 37.6% | 7.5% | Meet - Positive growth at test site |
| 2015 to 2016 | 4635 | -19.1% | 6.0% | Fail - Test percent loss >20 percentage points below reference site |
| **Marsh Site[1]** | | | | |
| **Year** | **Site** | **% Change Near Test Site** | **% Change Reference Site (4638)** | **Assessment of Year-to-Year Support** |
| 2012 to 2013 | 4634 | 106.2% | 78.1% | Meet - Positive growth at test site |
| 2013 to 2014 | 4634 | -17.1% | -44.0% | Meet - Test percent loss at lower rate than reference site loss |
| 2014 to 2015 | 4634 | -14.5% | 32.7% | Fail - Test percent loss >20 percentage points below reference site |
| 2015 to 2016 | 4634 | 61.7% | -14.5% | Meet - Positive growth at test site |
| | | | | **Three annual failures over four years - Impaired for FWP** |

**Table 3.2.5.**

Water quality assessments for fish and wildlife propagation (FWP) for subsegments designated as wetland assimilation areas in LAC 33:IX.1123. Table 3.

| Chinchuba Swamp Wetland, Mandeville (LA040805_00) | | | | |
|---|---|---|---|---|
| **Year** | **Site** | **% Change Near Test Site** | **% Change Reference Site (4608)** | **Assessment of Year-to-Year Support** |
| **2012 to 2013** | 4609 | -52.5% | -5.1% | Fail - Test percent loss >20 percentage points below reference site |
| **2013 to 2014** | 4609 | 87.8% | 26.5% | Meet - Positive growth at test site |
| **2014 to 2015** | 4609 | 12.2% | -23.2% | Meet - Positive growth at test site |
| **2015 to 2016** | 4609 | -5.8% | 49.1% | Fail - Test percent loss >20 percentage points below reference site |
| | | | | **Two annual failures over four years - Impaired for FWP** |

| East Tchefuncte Marsh Wetland, Mandeville (LA040806_00) | | | | |
|---|---|---|---|---|
| **Forested Site[1]** | | | | |
| **Year** | **Site** | **% Change Near Test Site** | **% Change Reference Site (4608)** | **Assessment of Year-to-Year Support** |
| **2012 to 2013** | 4612 | -49.0% | -5.1% | Fail - Test percent loss >20 percentage points below reference site |
| **2013 to 2014** | 4612 | 121.9% | 26.5% | Meet - Positive growth at test site |
| **2014 to 2015** | 4612 | -29.7% | -23.2% | Meet - Test percent loss is within 20 percentage points of reference site |
| **2015 to 2016** | 4612 | 26.0% | 49.1% | Meet - Positive growth at test site |
| | | | | **One annual failure over four years - Supports FWP** |

**Table 3.2.5.**

Water quality assessments for fish and wildlife propagation (FWP) for subsegments designated as wetland assimilation areas in LAC 33:IX.1123. Table 3.

| Cote Gelee Wetland, Broussard (LA060801_001) | | | | |
|---|---|---|---|---|
| **Year** | **Site** | **% Change Near Test Site** | **% Change Reference Sites (4615, 4616)** | **Assessment of Year-to-Year Support** |
| 2012 to 2013 | 4617 | -39.6% | -62.7% | Meet - Test percent loss at lower rate than reference site loss |
| 2013 to 2014 | 4617 | 81.4% | 89.6% | Meet - Positive growth at test site |
| 2014 to 2015 | 4617 | -10.3% | -2.2% | Meet - Test percent loss is within 20 percentage points of reference site |
| 2015 to 2016 | 4617 | -10.4% | -0.6% | Meet - Test percent loss is within 20 percentage points of reference site |
| | | | | **No annual failures over four years - Supports FWP** |

| Breaux Bridge Swamp, Breaux Bridge (LA060805_00) | | | | |
|---|---|---|---|---|
| **Year** | **Site** | **% Change Near Test Site** | **% Change Reference Site (4586)** | **Assessment of Year-to-Year Support** |
| 2012 to 2013 | 4588 | -14.2% | -26.1% | Meet - Test percent loss at lower rate than reference site loss |
| 2013 to 2014 | 4588 | -31.0% | -21.7% | Meet - Test percent loss is within 20 percentage points of reference site |
| 2014 to 2015 | 4588 | 21.8% | 47.0% | Meet - Positive growth at test site |
| 2015 to 2016 | 4588 | -10.8% | -17.2% | Meet - Test percent loss at lower rate than reference site loss |
| | | | | **No annual failures over four years - Supports FWP** |

**Table 3.2.5.**

Water quality assessments for fish and wildlife propagation (FWP) for subsegments designated as wetland assimilation areas in LAC 33:IX.1123. Table 3.

| Cypress Island Coulee Wetland, St. Martinville (LA060806_00) | | | | |
|---|---|---|---|---|
| **Year** | **Site[2]** | **% Change Near Test Site** | **% Change Reference Sites (4615, 4616)** | **Assessment of Year-to-Year Support** |
| 2012 to 2013 | 4591, 4592, 4595 | -45.0% | -62.7% | Meet - Test percent loss at lower rate than reference site loss |
| 2013 to 2014 | 4591, 4592, 4595 | 94.3% | 89.5% | Meet - Positive growth at test site |
| 2014 to 2015 | 4591, 4592, 4595 | 35.0% | -2.2% | Meet - Positive growth at test site |
| 2015 to 2016 | 4591, 4592, 4595 | -45.3% | -0.7% | Fail - Test percent loss >20 percentage points below reference site |
| | | | | **One annual failure over four years - Supports FWP** |

**Table 3.2.5.**

Water quality assessments for fish and wildlife propagation (FWP) for subsegments designated as wetland assimilation areas in LAC 33:IX.1123. Table 3.

| Thibodaux Swamp, Thibodaux (LA120207_00) | | | | |
|---|---|---|---|---|
| **Year** | **Site** | **% Change Near Test Site** | **% Change Reference Sites (4644, 4751, 4752)** | **Assessment of Year-to-Year Support** |
| 2013 to 2014 | 4645 | -33.8% | 45.3% | Fail - Test percent loss >20 percentage points below reference site |
| 2014 to 2015 | 4645 | 16.9% | 6.2% | Meet - Positive growth at test site |
| 2015 to 2016 | 4645 | -20.4% | -36.3% | Meet - Test percent loss at lower rate than reference site loss |
| 2016 to 2017 | 4645 | -39.5% | 24.6% | Fail - Test percent loss >20 percentage points below reference site |
| | | | | **Two annual failures over four years - Impaired for FWP** |

**Table 3.2.5.**

Water quality assessments for fish and wildlife propagation (FWP) for subsegments designated as wetland assimilation areas in LAC 33:IX.1123. Table 3.

| Bayou Ramos Swamp Wetland, Amelia (LA120208_00) | | | | |
|---|---|---|---|---|
| **Year** | **Site** | **% Change Near Test Site** | **% Change Reference Sites (4604, 4605, 4606)** | **Assessment of Year-to-Year Support** |
| 2012 to 2013 | 4603 | 640.5% | 292.0% | Meet - Positive growth at test site |
| 2013 to 2014 | 4603 | -51.3% | 22.5% | Fail - Test percent loss >20 percentage points below reference site |
| 2014 to 2015 | 4603 | 9.4% | -4.2% | Meet - Positive growth at test site |
| 2015 to 2016 | 4603 | 18.4% | 7.3% | Meet - Positive growth at test site |
| | | | | **One annual failure over four years - Supports FWP** |

1. In some wetlands data for both forest and marsh wetland types was present. In these cases the method was performed independently for the Near site and its Reference site by both wetland types.
2. Data for multiple test sites were averaged to determine percent change from year-to-year.

## External Data and Information

LDEQ's routine ambient monitoring data (described above) provided the primary set of data and information used for water quality assessments and listing decisions. However, LDEQ also used external data sets and information which are described below.

### Louisiana Department of Health Fish Advisory and Beach Monitoring Data

LDEQ used LDH fishing and swimming advisory information and enterococci bacteria data sets collected for the state's Beach Monitoring Program. For water bodies within a subsegment with fish consumption or swimming advisories, the advisory water body was also named in the 2018 IR. Impairments of this nature are water body-specific issues not directly related to the overall subsegment.

LDEQ evaluated the LDH beach monitoring data based on the federally-promulgated enterococci criteria for Louisiana. USEPA uses a single sample criterion of 130 colony forming units (cfu)/100 mL. For marine recreational waters, any "rolling" geometric mean for data collected over any five-week interval that exceeds 35 cfu/100 mL results in an impairment. Enterococci data collected as part of LDH's beach monitoring were also evaluated using USEPA's new assessment rule of 10%. Under this rule if more than 10% of samples collected over any "rolling" five-week interval exceeds the statistical threshold value of 130 cfu/100 mL, then an impairment for enterococci is reported. Duplicate samples in the dataset were treated as QC samples and were not averaged with the target sample to keep evaluation methods consistent with LDEQ protocol.

### Third-Party Data

LDEQ published a request for data and information during a 30-day public notice period which ended December 2, 2015. The Lake Pontchartrain Basin foundation provided an extensive data set from its Northshore streams data collection effort. Assessment results from this data set and analysis are found in the following section.

### Lake Pontchartrain Basin Foundation Data Review

The St. Tammany Parish Government (STPG) provided water quality data collected in the St.Tammany Parish area. Data was collected by the Lake Pontchartrain Basin Foundation (LPBF). The dataset included seven waterbodies in 10 Louisiana assessed subsegments (Two water bodies extend over two or three subsegments.). The water bodies of interest to LDEQ are the Bogue Falaya River, Tchefuncte River, Ponchitolawa Creek, Bayou LaCombe, Bayou Paquet, Bayou Liberty, and Bayou Bonfouca. The relevant subsegments which include portions of these water bodies are listed in Table 3.2.6. The STPG/LPBF data included 1,091 records of sampling events in the St. Tammany area. Of these 1,091 sampling attempts, 145 were unsuccessful due to lack of access or lack of sufficient depth or flow for sampling. There were 946 successful sampling events which resulted in a water quality dataset consisting of dissolved oxygen, saturated dissolved oxygen, turbidity, temperature, conductivity, salinity, pH, and oxygen solubility. This data was collected between August, 2013 to August 2016. The data was found to be collected according to an acceptable QAPP and the third-party data certification was signed by a representative of St. Tammany Parish. LDEQ considered the STPG/LPBF data for dissolved oxygen, temperature, turbidity, and pH to assess the subsegments of interest.

**Table 3.2.6.**

Sites sampled by Lake Pontchartrain Basin Foundation (LPBF) were assessed for usefulness of data. If the site is located on the assessed waterbody for a subsegment, they are denoted as "Y" in the column, "On Assessed waterbody?" Relevant subsegment information is shown here including the subsegment number, and description.[1]

| LPBF Site | LPBF Location | On Assessed waterbody? | LDEQ Subsegment | LDEQ Subsegment Description |
|---|---|---|---|---|
| HS 01 | Ponchitolawa at Frontage Rd SE of interstate | Y | 040802 | Ponchitolawa Creek—From headwaters to US Highway 190 (Scenic) |
| HS 03 | Ponchitolawa N of I-12 at Judy Ave | N | | |
| HS 04 | Ponchitolawa at Jefferie Street | Y | | |
| HS 05 | STP lateral 24 at Marion Road | N | | |
| HS 06 | Ponchitolawa at HWY 59 | Y | | |
| HS 02 | Bogue Falaya near confluence with Tchefuncte River | Y | 040804 | Bogue Falaya River—From headwaters to Tchefuncte River (Scenic) [12] |
| HS 07 | Tchefuncte after Pontchartrain. Confluence at Covington Country Club | Y | 040808 | Tchefuncte River—From Bogue Falaya River to La. Highway 22 (Scenic) |
| HS 08 | Bayou Tete L'Ours Beau Chene WWTP | N | | |
| HS 09 | Hwy 22 at Tchefuncte | Y | | |
| HS 10 | Tchefuncte River at 3 Rivers Road | Y | | |
| HS 49 | Bayou Lacombe at Krentel Road | Y | 040901 | Bayou LaCombe—From headwaters to Interstate Highway 12 (Scenic) |
| HS 42 | Bayou Liberty at Journey Road | Y | 040906 | Bayou Liberty—From La. Highway 433 to Bayou Bonfouca; includes Bayou de Chien (Estuarine) |

**Table 3.2.6.**

Sites sampled by Lake Pontchartrain Basin Foundation (LPBF) were assessed for usefulness of data. If the site is located on the assessed waterbody for a subsegment, they are denoted as "Y" in the column, "On Assessed waterbody?" Relevant subsegment information is shown here including the subsegment number, and description.[1]

| LPBF Site | LPBF Location | On Assessed waterbody? | LDEQ Subsegment | LDEQ Subsegment Description |
|---|---|---|---|---|
| HS 34 | Bayou Vincent at Eagle Creek Mobile Home Community | N | 040907 | Bayou Bonfouca—From headwaters to La. Highway 433 |
| HS 35 | Bayou Vincent at Brown River Road - Industrial | N | | |
| HS 37 | Bayou Bonfouca at Jackson Road | Y | | |
| HS 38 | Bayou Bonfouca at W. Hall Ave | Y | | |
| HS 45a | Bayou Vincent at Carnation Street | N | | |
| HS 51 | Bayou Lacombe at Fish Hatchery Road | Y | 040912 | Bayou LaCombe—From Interstate Highway 12 to US Highway 190 (Scenic) |
| HS 50 | Big Branch at Berry Todd Road | N | 040913 | Bayou LaCombe—From US Highway 190 to CDM Ecoregion boundary (Scenic) (Estuarine) |
| HS 52 | Bayou Lacombe at Balehi Road | Y | | |
| HS 53 | Cypress Bayou at Grand Ave | N | | |
| HS 54 | Cypress Bayou at Fairwell Drive | N | | |

**Table 3.2.6.**

Sites sampled by Lake Pontchartrain Basin Foundation (LPBF) were assessed for usefulness of data. If the site is located on the assessed waterbody for a subsegment, they are denoted as "Y" in the column, "On Assessed waterbody?" Relevant subsegment information is shown here including the subsegment number, and description.[1]

| LPBF Site | LPBF Location | On Assessed waterbody? | LDEQ Subsegment | LDEQ Subsegment Description |
|---|---|---|---|---|
| HS 33 | Bayou Liberty at Royal 18 Canal Confluence | N | 040915 | Bayou Liberty—From LMRAP Ecoregion boundary to La. Highway 433 |
| HS 36 | Oakmont treatment pond Airport Road at Canal | N | | |
| HS 39 | Bayou Liberty at Neslo Road off Tammany Trace | Y | | |
| HS 40 | Bayou Liberty at Jefferson Ave | Y | | |
| HS 44 | Bayou Liberty at Belair | N | | |
| HS 48 | Bayou Liberty at Scenic Drive | Y | | |
| HS 41 | Bayou Paquet at Bayou Paquet Road | Y | 040916 | Bayou Paquet—From headwaters to Bayou Liberty (Estuarine) |
| HS 43 | Bayou Paquet at Mayer Road | N | | |
| HS 47 | Bayou Paquet at Paquet Way | Y | | |

1. Dissolved oxygen assessments based on the eLMRAP dissolved oxygen criteria are subject to change pending the outcome of current litigation against USEPA.

Assessment of the STPG/LPBF dataset for subsegments where LDEQ also has sample sites confirmed the original water quality assessments done by LDEQ using routine water quality monitoring data. The STPG/LPBF dataset also provided data for three newly delineated subsegments: Pontchitolawa Creek (LA040802_00); Bayou Lacombe-from U.S. Highway 190 to Coastal Deltaic Marsh Ecoregion boundary (LA040913_00); and Bayou Paquet (LA040916_00). In each case the data provided by STPG/LPBF was used to assess the subsegments for DO, temperature, turbidity and pH.

### Coastal Louisiana Data Collected by Third-Parties

In addition to the previously described data, for the 2018 IR LDEQ located and assessed third-party datasets for coastal Louisiana subsegments. This resulted in the analysis of data from four organizations: 1) Lake Pontchartrain Basin Foundation; 2) Louisiana University Marine Consortium (LUMCON); 3) U.S. Geological Survey (USGS); and 4) the Gulf States Marine Fisheries Commission, Southeast Area Monitoring and Assessment Program (SEAMAP). All data met LDEQ quality assurance/quality control requirements by being collected and analyzed with approved quality assurance project plans or other recognized data collection and validation methods.

Data from each organization was obtained either through contact with the organization or through available internet resources. All data was limited to samples collected between October 1, 2013 – September 30, 2017. Sites were located using GIS to determine which Louisiana subsegments they represented and limited to only those sites within Louisiana territorial waters. Where more than one site within a subsegment was sampled by an organization, the data was combined for assessment of the subsegment. Dissolved oxygen assessments were made based on the appropriate LDEQ water quality criteria using the conventional "10% rule." See Table 3.2.2 for more details on assessment methods. In some cases additional parameters were available in the datasets; however, in all cases either there were no criteria for the parameters or the parameters were found to be fully supported based on assessment rules found in Table 3.2.2.

A summary of all dissolved oxygen assessments on subsegments for which third-party data was available is found in Table 3.2.7. A total of 21 subsegments were assessed based on 25 third-party datasets. Six subsegments had assessments in which the third-party and LDEQ both indicated full support of the DO criterion. Two subsegments showed agreement between the datasets and impairment of the DO criterion. A total of five subsegments showed disagreement between the third-party and LDEQ datasets, resulting in a final assessment decision of impairment for low DO. Finally, eight subsegments showed disageement between the two datasets in which the LDEQ data was used to give an assessment of fully supporting the DO criterion. LDEQ's reconciliation of third-party data assessments and LDEQ conventional assessments is provided in the last column of Table 3.2.7. An extensive and detailed spreadsheet demonstrating how the third-party data assessments and reconciliation with LDEQ assessments is available upon request.

**Table 3.2.7.**

Reconciliation of third-party dissolved oxygen data assessments and Louisiana Department of Environmental Quality 2018 Water Quality Integrated Report conventional dissolved oxygen data assessments[1].

| Subsegment Number | Subsegment Name | Collecting Organization | Sample Type | Water Layer | Third-Party Assessment Result | Conventional 2018 IR Assessment Results | Third-Party Data Reconciliation with Conventional 2018 IR Assessments |
|---|---|---|---|---|---|---|---|
| 010501 | Lower Atchafalaya Basin Floodway | USGS | Continuous Monitor | Surface | Not Supported | Fully Supported | USGS dissolved oxygen continuous monitoring from 12/9/2014-9/30/17 collected at same location as LDEQ WQN site; Appears to be large plume of swamp water from Flat Lake, Lake Verret and upstream swamps that affects DO due to natural conditions - No change to conventional 2018 IR assessment - **Fully supported**[2] |
| 010901 | Atchafalaya Bay and Delta and Gulf Waters to State 3 mile limit | SEAMAP | Depth Profile | Water Column | Fully Supported | Fully Supported | Third-party and conventional LDEQ assessments agree - No change to conventional 2018 IR assessment - **Fully supported** |

**Table 3.2.7.**

Reconciliation of third-party dissolved oxygen data assessments and Louisiana Department of Environmental Quality 2018 Water Quality Integrated Report conventional dissolved oxygen data assessments[1].

| Subsegment Number | Subsegment Name | Collecting Organization | Sample Type | Water Layer | Third-Party Assessment Result | Conventional 2018 IR Assessment Results | Third-Party Data Reconciliation with Conventional 2018 IR Assessments |
|---|---|---|---|---|---|---|---|
| 020902 | Little Lake (Estuarine) | USGS | Continuous Monitor | Surface | Fully Supported | Fully Supported | Third-party and conventional LDEQ assessments agree - No change to conventional 2018 IR assessment - **Fully supported** |
| 020903 | Barataria Waterway (Estuarine) | USGS | Continuous Monitor | Surface | Fully Supported | Fully Supported | Third-party and conventional LDEQ assessments agree - No change to conventional 2018 IR assessment - **Fully supported** |
| 021101 | Barataria Bay; includes Caminada Bay, Hackberry Bay, Bay Batiste, and Bay Long (Estuarine) | USGS | Continuous Monitor | Surface | Fully Supported | Fully Supported | Third-party and conventional LDEQ assessments agree - No change to conventional 2018 IR assessment - **Fully supported** |

**Table 3.2.7.**

Reconciliation of third-party dissolved oxygen data assessments and Louisiana Department of Environmental Quality 2018 Water Quality Integrated Report conventional dissolved oxygen data assessments[1].

| Subsegment Number | Subsegment Name | Collecting Organization | Sample Type | Water Layer | Third-Party Assessment Result | Conventional 2018 IR Assessment Results | Third-Party Data Reconciliation with Conventional 2018 IR Assessments |
|---|---|---|---|---|---|---|---|
| 021102 | Barataria Basin Coastal Bays and Gulf Waters to the State 3 mile limit | LUMCON | Depth Profile | Water Column | Not Supported | Fully supported with conventional IR assessment; Not supported with LDEQ coastal study | Third-party and conventional LDEQ assessments agree with not supporting - No change to conventional 2018 IR assessment - **Not supported** |
| 021102 | Barataria Basin Coastal Bays and Gulf Waters to the State 3 mile limit | SEAMAP | Depth Profile | Water Column | Not Supported | Full supported with conventional IR assessment; Not supported with LDEQ coastal study | Third-party and conventional LDEQ assessments agree with not supporting - No change to conventional 2018 IR assessment - **Not supported** |

**Table 3.2.7.**

Reconciliation of third-party dissolved oxygen data assessments and Louisiana Department of Environmental Quality 2018 Water Quality Integrated Report conventional dissolved oxygen data assessments[1].

| Subsegment Number | Subsegment Name | Collecting Organization | Sample Type | Water Layer | Third-Party Assessment Result | Conventional 2018 IR Assessment Results | Third-Party Data Reconciliation with Conventional 2018 IR Assessments |
|---|---|---|---|---|---|---|---|
| 041001 | Lake Pontchartrain-West of US-11 bridge (Estuarine) | LPBF | Depth Profile | Water Column | Not Supported | Fully Supported | Insufficient third-party dataset to override conventional LDEQ assessment - No change to conventional 2018 IR assessment - **Fully supported** |
| 041401 | New Orleans East Leveed Water Bodies (Estuarine) | LPBF | Surface, Middle, Bottom (SMB) | Water Column | Not Supported | Fully Supported | Insufficient third-party dataset to override conventional LDEQ assessment - No change to conventional 2018 IR assessment - **Fully supported** |
| 041901 | Mississippi River Gulf Outlet (MRGO)-From ICWW to Breton Sound at MRGO mile 30 | LPBF | SMB | Water Column | Not Supported | Insufficient Data | Sufficient third-party dataset showing failure to support DO criterion; Report as impaired for DO with IR Category 5RC-Revise Criteria - **Not supported** |

**Table 3.2.7.**

Reconciliation of third-party dissolved oxygen data assessments and Louisiana Department of Environmental Quality 2018 Water Quality Integrated Report conventional dissolved oxygen data assessments[1].

| Subsegment Number | Subsegment Name | Collecting Organization | Sample Type | Water Layer | Third-Party Assessment Result | Conventional 2018 IR Assessment Results | Third-Party Data Reconciliation with Conventional 2018 IR Assessments |
|---|---|---|---|---|---|---|---|
| 042001 | Lake Borgne | LPBF | Depth Profile | Water Column | Fully Supported | Fully Supported | Third-party and conventional LDEQ assessments agree -No change to conventional 2018 IR assessment - **Fully supported** |
| 042003 | Bayou La Loutre-From MRGO to Eloi Bay (Estuarine) | LPBF | SMB | Water Column | Fully Supported | Fully Supported | Third-party and conventional LDEQ assessments agree -No change to conventional 2018 IR assessment - **Fully supported** |
| 042201 | Chandeleur Sound | LPBF | SMB | Water Column | Not Supported | Fully Supported | Sufficient third-party dataset showing failure to support DO criterion; Report as impaired for DO with IR Category 5RC-Revise Criteria - **Not supported** |

**Table 3.2.7.**

Reconciliation of third-party dissolved oxygen data assessments and Louisiana Department of Environmental Quality 2018 Water Quality Integrated Report conventional dissolved oxygen data assessments[1].

| Subsegment Number | Subsegment Name | Collecting Organization | Sample Type | Water Layer | Third-Party Assessment Result | Conventional 2018 IR Assessment Results | Third-Party Data Reconciliation with Conventional 2018 IR Assessments |
|---|---|---|---|---|---|---|---|
| 042202 | California Bay and Breton Sound | LPBF | SMB | Water Column | Not Supported | Fully Supported | Sufficient third-party dataset showing failure to support DO criterion; Report as impaired for DO with IR Category 5RC-Revise Criteria - **Not supported** |
| 042203 | Bay Boudreau | LPBF | SMB | Water Column | Not Supported | Fully Supported | Sufficient third-party dataset showing failure to support DO criterion; Report as impaired for DO with IR Category 5RC-Revise Criteria - **Not supported** |
| 042206 | Eloi Bay | LPBF | SMB | Water Column | Not Supported | Fully Supported | Insufficient data in third-party dataset to override conventional LDEQ assessment - No change to conventional 2018 IR assessment - **Fully supported** |

**Table 3.2.7.**

Reconciliation of third-party dissolved oxygen data assessments and Louisiana Department of Environmental Quality 2018 Water Quality Integrated Report conventional dissolved oxygen data assessments[1].

| Subsegment Number | Subsegment Name | Collecting Organization | Sample Type | Water Layer | Third-Party Assessment Result | Conventional 2018 IR Assessment Results | Third-Party Data Reconciliation with Conventional 2018 IR Assessments |
|---|---|---|---|---|---|---|---|
| 042207 | Lake Fortuna | LPBF | SMB | Water Column | Not Supported | Fully Supported | Insufficient data in third-party dataset to override conventional LDEQ assessment - No change to conventional 2018 IR assessment - **Fully supported** |
| 042209 | Lake Pontchartrain Basin Coastal Bays and Gulf Waters to the State 3 mile limit | LPBF | SMB | Water Column | Not Supported | Fully Supported | Sufficient third-party dataset showing failure to support DO criterion; Report as impaired for DO with IR Category 5RC-Revise Criteria - **Not supported** |
| 050901 | Mermentau River Basin Coastal Bays and Gulf Waters to the State 3 mile limit | SEAMAP | Depth Profile | Water Column | Not Supported | Fully Supported | Insufficient third-party dataset to override conventional LDEQ assessment - No change to conventional 2018 IR assessment - **Fully supported** |

**Table 3.2.7.**

Reconciliation of third-party dissolved oxygen data assessments and Louisiana Department of Environmental Quality 2018 Water Quality Integrated Report conventional dissolved oxygen data assessments[1].

| Subsegment Number | Subsegment Name | Collecting Organization | Sample Type | Water Layer | Third-Party Assessment Result | Conventional 2018 IR Assessment Results | Third-Party Data Reconciliation with Conventional 2018 IR Assessments |
|---|---|---|---|---|---|---|---|
| 070601 | Mississippi River Basin Coastal Bays and Gulf Waters to the State 3 mile limit | LPBF | SMB | Water Column | Fully Supported | Full supported with conventional IR assessment; Not supported with DEQ coastal study | Insufficient third-party dataset to override conventional LDEQ assessment - No change to conventional 2018 IR assessment - **Not supported** |
| 070601 | Mississippi River Basin Coastal Bays and Gulf Waters to the State 3 mile limit | LUMCON | Depth Profile | Water Column | Not Supported | Full supported with conventional IR assessment; Not supported with DEQ coastal study | Insufficient data in third-party dataset to override conventional LDEQ assessment - No change to conventional 2018 IR assessment - **Not supported** |

**Table 3.2.7.**

Reconciliation of third-party dissolved oxygen data assessments and Louisiana Department of Environmental Quality 2018 Water Quality Integrated Report conventional dissolved oxygen data assessments[1].

| Subsegment Number | Subsegment Name | Collecting Organization | Sample Type | Water Layer | Third-Party Assessment Result | Conventional 2018 IR Assessment Results | Third-Party Data Reconciliation with Conventional 2018 IR Assessments |
|---|---|---|---|---|---|---|---|
| 070601 | Mississippi River Basin Coastal Bays and Gulf Waters to the State 3 mile limit | SEAMAP | Depth Profile | Water Column | Not Supported | Full supported with conventional IR assessment; Not supported with DEQ coastal study | Insufficient data in third-party dataset to override conventional LDEQ assessment - No change to conventional 2018 IR assessment - **Not supported** |
| 110701 | Sabine River Basin Coastal Bays and Gulf Waters to State 3 mile limit | SEAMAP | Depth Profile | Water Column | Not Supported | Fully Supported | Insufficient data in third-party dataset to override conventional LDEQ assessment - No change to conventional 2018 IR assessment - **Fully supported** |

**Table 3.2.7.**

Reconciliation of third-party dissolved oxygen data assessments and Louisiana Department of Environmental Quality 2018 Water Quality Integrated Report conventional dissolved oxygen data assessments[1].

| Subsegment Number | Subsegment Name | Collecting Organization | Sample Type | Water Layer | Third-Party Assessment Result | Conventional 2018 IR Assessment Results | Third-Party Data Reconciliation with Conventional 2018 IR Assessments |
|---|---|---|---|---|---|---|---|
| 120806 | Terrebonne Basin Coastal Bays and Gulf Waters to the State 3 mile limit | LUMCON | Depth Profile | Water Column | Not Supported | Full supported with conventional IR assessment; Full supported with DEQ coastal DO study | Insufficient data in third-party dataset to override conventional LDEQ assessment - No change to conventional 2018 IR assessment - **Fully supported** |
| 120806 | Terrebonne Basin Coastal Bays and Gulf Waters to the State 3 mile limit | SEAMAP | Depth Profile | Water Column | Fully Supported | Full supported with conventional IR assessment; Full supported with DEQ coastal DO study | Third-party and conventional LDEQ assessments agree - No change to conventional 2018 IR assessment - **Fully supported** |

1. Details of third-party data and assessments available upon request
2. See Appendix F for further details regarding this decision.

## Coastal Subsegments Affected by Oil Spill and/or Cleanup Activities

On April 20, 2010, BP's Deepwater Horizon drilling rig operating in the Gulf of Mexico approximately 50 miles off the Mississippi River delta exploded and sank. This triggered an oil spill from the damaged riser at the bottom of the Gulf that continued until August 4, 2010 when a static kill procedure effectively closed the well. The well was then cemented and permanently closed by September 19, 2010. The resulting oil spill affected a large portion of Louisiana's coastline. LDEQ and other agencies continue to analyze the impact of the spill on Louisiana's coastal waters. Results of this analysis will be presented in future reports by LDEQ as well as by other national and state agencies and academic researchers.

In the 2012 IR, LDEQ estimated that 42 coastal area subsegments were impaired by the oil spill and associated cleanup activities. LDEQ assessed these subsegments as being potentially and/or temporarily impaired for FWP, OYS, and/or PCR. The suspected impairments were based on fish, crab, shrimp, and shellfish closures issued by LDWF and LDH, as well as Shoreline Cleanup and Assessment Technique (SCAT) Team surveys of the region. Closure information was taken from the Environmental Response Management Application (ERMA) Gulf Response Website (NOAA 2010).[4]

In the 2014 IR, LDEQ reduced both the number and size of subsegments assessed as impaired by residual surface and sub-surface oil/tar balls/tar mats. This was done based on more recent SCAT Team surveys available at that time. The aerial extent of impairment was significantly reduced or elimintated in each of the previously impaired subsegments.

In the 2016 IR, all spill-related FWP and OYS impairments originally reported in the 2012 and 2014 IRs were updated to full support due to lifting of the LDWF and LDH fishing closures. For PCR, six limited portions of subsegments were assessed as being potentially and/or temporarily imparied for PCR.

For the 2018 IR, the six remaining partial subsegments identified in the 2016 IR were reassessed by onsite visual evaluations conducted from January – March of 2018. Based on these reevaluations, all six areas (Table 3.2.8) were determined to now be fully supporting the previously impaired designated use of PCR. There was No Oil Observed (NOO) at two of the six areas. Limited occurrences of Surface oil Residue Balls (SRBs) were observed at three of the areas. Reassessment of one area resulted in the observation of SRBs, Surface Residue (SR), Mousse (MS), and Oiled Vegetative Material (OVM). However, the observed SRBs, SR, MS and OVM were determined to be spatially intermittent in nature and, therefore, not impairing the PCR use of the areas. Therefore, all six partial subsegments previous identified as potentially and/or temporarily impaired for PCR have been removed from the 2018 IR.

[4] Disclaimer: The analysis of water quality contained in this report does not rely on information collected as part of the Deepwater Horizon Natural Resource Damage Assessment (NRDA), and is not intended to analyze impacts resulting from the Deepwater Horizon oil spill and related response for NRDA purposes.

**Table 3.2.8.**

2018 Water Quality Integrated Report reassessments of partial subsegments previously suspected of impairment to primary contact recreation use following the Deepwater Horizon oil spill. Reassessments based on visual observations by Louisiana Department of Environmental Quality staff from January – March 2018.[1]

| Partial Subsegment Number | Partial Subsegment Description | Visual Observations from Site Visits: January – March 2018 (One observation per site) |
|---|---|---|
| LA021101_005 | Shoreline and open water areas within 100 yards of shorelines near Bay Jimmy and St. Mary's Point, within northern LA021101_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies. | Limited occurrences of Surface oil Residual Balls, Surface Residue, Mousse, and Oiled Vegetative Material<br><br>All observed material determined to be spatially intermittent in nature and, therefore, no longer impairing primary contact recreation |
| LA021101_006 | Gulf side of Grand Terre II Island, approx. 500 meters of open beach and adjacent waters, eastern tip of island, within LA021101_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies. | Limited occurrences of Surface oil Residual Balls<br><br>All observed material determined to be spatially intermittent in nature and, therefore, no longer impairing primary contact recreation |
| LA021101_007 | Gulf side shoreline of eastern tip of Elmers Island, 500 meters of open beach and adjacent waters, within LA021101_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies. | No Oil Observed<br><br>No longer impairing primary contact recreation |
| LA021101_008 | Back bay side of Elmers Island, approximately 400 meters of isolated areas of open beach and adjacent waters, within LA021101_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies. | Limited occurrences of Surface oil Residual Balls<br><br>All observed material determined to be spatially intermittent in nature and, therefore, no longer impairing primary contact recreation |

**Table 3.2.8.**

2018 Water Quality Integrated Report reassessments of partial subsegments previously suspected of impairment to primary contact recreation use following the Deepwater Horizon oil spill. Reassessments based on visual observations by Louisiana Department of Environmental Quality staff from January – March 2018.[1]

| Partial Subsegment Number | Partial Subsegment Description | Visual Observations from Site Visits: January – March 2018 (One observation per site) |
|---|---|---|
| LA120802_002 | Gulf side of West Timbalier Island, 200m of beach face along western tip of island, within southeast area of LA120802_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies. | No Oil Observed<br><br>No longer impairing primary contact recreation |
| LA120803_002 | Bay side of West Timbalier Island, at eastern end of island, within southern area of LA120803_00. This unit is added for spill impact tracking purposes only and is not a subsegment as defined by LAC 33:IX.1123.A. et seq. No other assessments were made for these water bodies. | Limited occurrences of Surface oil Residual Balls<br><br>All observed material determined to be spatially intermittent in nature and, therefore, no longer impairing primary contact recreation |

## Coastal Louisiana Dissolved Oxygen Study and Assessment

Following USEPA's deferred decision on Louisiana's 2016 IR assessment of coastal Terrebonne waters, subsegment LA120806_00, LDEQ responded to USEPA's decision by letter dated June 27, 2017. In its letter LDEQ pointed out that USEPA's decision was based on data collected by the LUMCON between 2008 and 2011. At the time of the 2016 IR's development the LUMCON data was outside the period of record used for the 2016 IR, which was October 2011-September 2015. USEPA acknowledged this fact in its decision document but chose to disregard it. EPA also acknowledged that its decision was based on data from only two sites within LA120806_00, one of which was limited to a single sample collected during the peak of the summer hypoxic period. Use of this limited data seriously biased the results of USEPA's assessment by not accounting for full seasonal effects in the subsegment.

Since finalization of the 2016 IR no significant additional data was collected by LDEQ in the three coastal subsegments described below. However, LDEQ did consider third-party data collected by LUMCON and SEAMAP. Results of this consideration, found in Table 7, page 38 of this document, support LDEQ's original 2016 IR assessment of full support for DO in LA120086_00. The following assessment discussion is taken from the 2016 IR, results of which remain in place for the 2018 IR.

In order to better understand depth profile DO levels in Louisiana waters, starting in December 2014 LDEQ initiated data collection for DO and related in situ meter data to expanded spatial and temporal coverage for these parameters. Data was collected in three subsegments of Louisiana's state territorial waters of the Gulf of Mexico:

LA021102_00 – Barataria Basin Coastal Bays and Gulf Waters to the State 3-mile limit

LA070601_00 – Mississippi River Basin Coastal Bays and Gulf Waters to the State 3-mile limit

LA120806_00 – Terrebonne Basin Coastal Bays and Gulf Waters to the State 3-mile limit

In particular, the data was used to characterize and assess DO concentrations at multiple depths and times of year in order to contribute to characterizing the depth profile observations for DO, salinity, temperature and related parameters in Louisiana territorial waters.

Electronic meter readings were taken at one meter intervals beginning at one meter below the surface and extending to approximately one to 0.5 meter above the bottom. Each subsegment in the study had a total of eight sample sites located along two transects running approximately parallel to the coast. Each transect had four sample sites (Figure 3.2.1, Table 3.2.9).

Sample runs were conducted quarterly in each subsegment over a 12-month period. Subsegments were rotated on a monthly basis, such that the first subsegment was sampled in December, the second in January, the third in February, then returning to the first subsegment in March. This pattern was repeated until all three subsegments were sampled a total of four times through the 12-month period. Sample dates within the month for each subsegment varied according to weather conditions in the Gulf of Mexico and the work schedule of field staff responsible for the sampling. All sampling was completed in November of 2015. Subsegments and dates sampled are listed in Table 3.2.10. February and May sampling events were delayed to the following months due to weather related safety concerns.

For 2016 IR assessment purposes, dissolved oxygen data was analyzed using the routine criterion assessment procedure for dissolved oxygen. Under this procedure, if more than 10% of the

cumulative data collected over the course of the one-year study in a particular subsegment fell below the DO criterion of 5.0 mg/L, then the subsegment was reported as not supporting its FWP use. Data from all sites, depths, and dates for each subsegment were combined to assess each subsegment separately. Based on the data, subsegments LA021102_00 (Barataria coastal subsegment), and LA070601_00 (Mississippi coastal subsegment) did not meet the DO criterion for FWP. For the Barataria coastal subsegment a total of 36.7% of DO results were < 5.0 mg/L, while in the Mississippi coastal subsegment a total of 42.7% of DO results were below the criterion. The Terrebonne coastal subsegment (LA120806_00) was found to be fully supporting the DO criterion for FWP with only 6.0% of results below the DO criterion.

As a result, LA021102_00 and LA070601_00 were reported as impaired for FWP in the 2016 IR. LA120806_00 was reported as fully supporting FWP. In both the 2012 and 2014 IRs all three of these subsegments were reported as insufficient data (IRC 3) by LDEQ; however, this decision was overturned by USEPA, which assigned the subsegments to IRC 5 (TMDL required). For the 2016 IR, LDEQ has determined the most appropriate Integrated Report Category for the two subsegments not meeting the DO criterion is IRC 5RC (revise crieria). This decision is based on the following discussion.

As part of the sampling effort described above, salinity and temperature readings were collected along with DO. During the course of the field sampling and preliminary data analysis it was quickly recognized that salinity, in particular a sharp salinity increase or halocline with increasing depth, was a primary contributor for many of the low DO readings at greater depths below the surface.

Figures 3.2.2, 3.2.4, 3.2.5 are examples of the apparent effect of salinity, temperature and pressure on DO. The combination of these three parameters, density, is expressed as Sigma-t and shows a corresponding pycnocline. The charts are for all eight sites on various months in the three coastal subsegments studied. Each of the charts shows a sharp halocline and pycnocline at a depth of between three and seven meters, depending on the subsegment, site and overall depth.

The haloclines are marked by a rise in salinity from approximately 15 parts per thousand (ppt) at and above three meters to > 30 ppt one to two meters deeper. In many cases the salinity changed abruptly within the span of approximately one meter. Temperature showed a reversed but less pronounced change, with temperature falling slightly at approximately the same depth. In each of these cases the DO concentrations went from > 5.0 mg/L (meeting criterion) to < 4.0 mg/L (not meeting criterion). For many of the months and sites with strong haloclines DO dropped from meeting the criterion near the surface to < 1.0 mg/L near the bottom of the water column.

**Figure 3.2.1.**

Sample sites for Coastal Louisiana Dissolved Oxygen Study, December 2014 – November 2016.

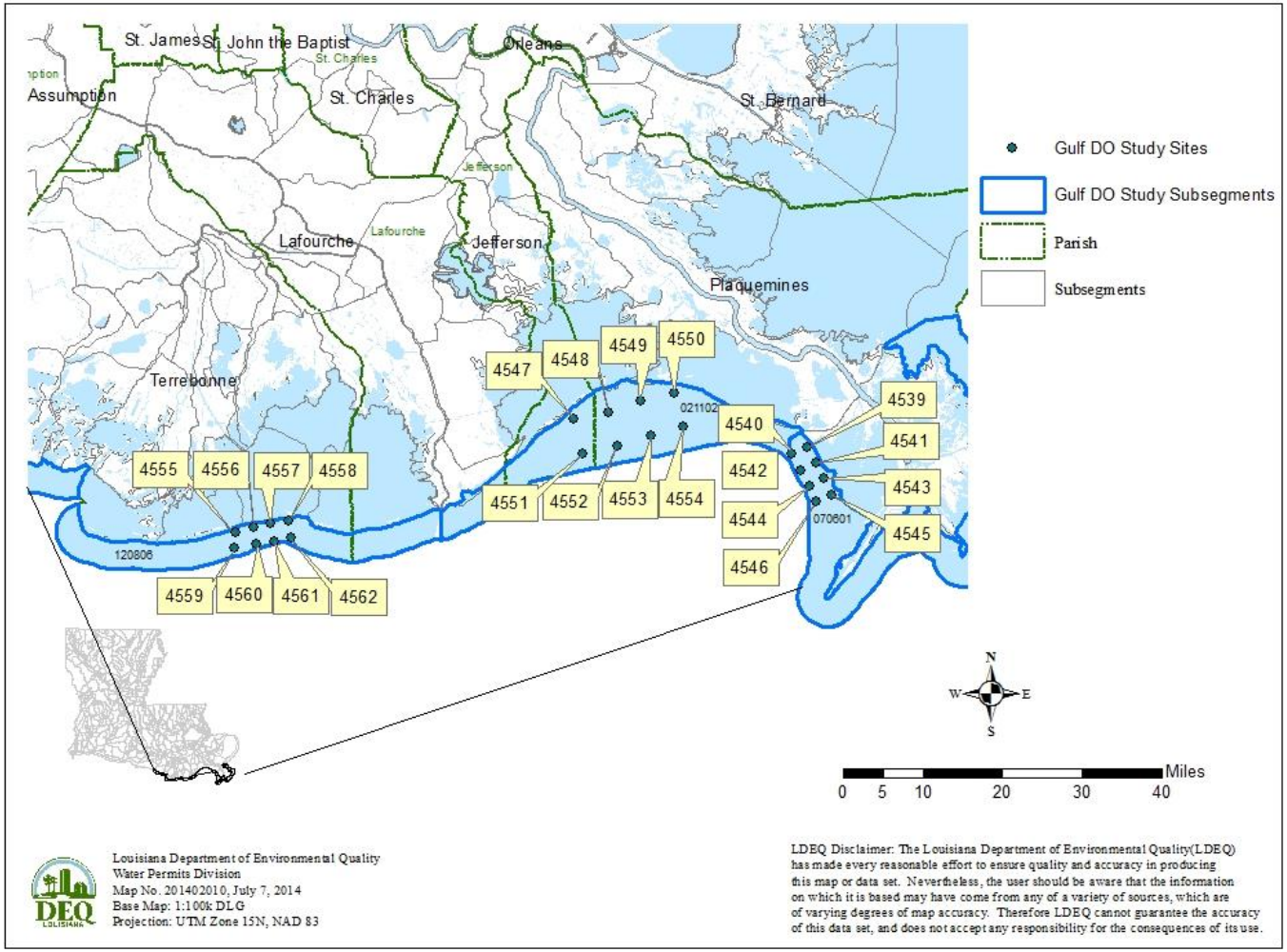


**Table 3.2.9.**

Site number and coordinates for sample sites used in Coastal Louisiana Dissolved Oxygen Study, December 2014 – November 2015.

| Subsegment Number | LDEQ Site Number | Inner or Outer Transect | Latitude | Longitude |
|---|---|---|---|---|
| LA021102_00 | 4547 | Inner | 29.2432 | -89.9433 |
| LA021102_00 | 4548 | Inner | 29.2562 | -89.874 |
| LA021102_00 | 4549 | Inner | 29.2725 | -89.805 |
| LA021102_00 | 4550 | Inner | 29.2862 | -89.734 |
| LA021102_00 | 4551 | Outer | 29.1805 | -89.9272 |
| LA021102_00 | 4552 | Outer | 29.1939 | -89.8563 |
| LA021102_00 | 4553 | Outer | 29.2109 | -89.7856 |
| LA021102_00 | 4554 | Outer | 29.2242 | -89.7176 |
| LA070601_00 | 4539 | Inner | 29.182 | -89.4621 |
| LA070601_00 | 4541 | Inner | 29.153 | -89.446 |
| LA070601_00 | 4543 | Inner | 29.1244 | -89.4295 |
| LA070601_00 | 4545 | Inner | 29.0936 | -89.4143 |
| LA070601_00 | 4540 | Outer | 29.1684 | -89.4943 |
| LA070601_00 | 4542 | Outer | 29.1389 | -89.478 |
| LA070601_00 | 4544 | Outer | 29.1099 | -89.4617 |
| LA070601_00 | 4546 | Outer | 29.0808 | -89.4477 |
| LA120806_00 | 4555 | Inner | 29.0536 | -90.652 |
| LA120806_00 | 4556 | Inner | 29.0614 | -90.6141 |
| LA120806_00 | 4557 | Inner | 29.0673 | -90.5775 |
| LA120806_00 | 4558 | Inner | 29.0714 | -90.5417 |
| LA120806_00 | 4559 | Outer | 29.0234 | -90.6542 |
| LA120806_00 | 4560 | Outer | 29.0296 | -90.6079 |
| LA120806_00 | 4561 | Outer | 29.0353 | -90.5724 |
| LA120806_00 | 4562 | Outer | 29.0394 | -90.5362 |

**Table 3.2.10.**

**Subsegments and sample dates for nearshore Gulf of Mexico dissolved oxygen profile study.**

| Coastal Mississippi (LA070601_00) | Coastal Barataria (LA021102_00) | Coastal Terrebonne (LA120806_00) |
|---|---|---|
| December 18, 2014 | January 29, 2015 | March 2, 2015 |
| March 24, 2015 | April 23, 2015 | June 19, 2015 |
| June 30, 2015 | July 10, 2015 | August 14, 2015 |
| September 18, 2015 | October 7, 2015 | November 24, 2015 |

By contrast, Figures 3.2.3, 3.2.6, 3.2.7 are examples of either the lack of, or a more moderate, halocline for the same subsegments but different months. For the Barataria and Terrebonne subsegments, Figures 3.2.3 and 3.2.7, respectively, there is little or no substantial rise in salinity at any of the sites and subsequently no marked decrease in DO, with no DO concentrations below 5.0 mg/L. However, for the Mississippi subsegment, Figure 3.2.5, while the halocline is less pronounced than in Figure 3.2.4, there is still a substantial rise in salinity with a corresponding decline in DO. Among all three subsegments, the Mississippi subsegment shows the most visually pronounced haloclines across all sites and dates when reviewing the figures. These pronounced haloclines appear to be associated with the greatest drop in DO through the water column.

This last finding agrees with the Mississippi subsegment having the highest number of criterion failures overall, with 42.7% of DO readings falling below 5.0 mg/L. The Barataria subsegment had the next lowest number of sample sites with a significant halocline effect, resulting in a lower number of DO readings, 36.7%, below 5.0 mg/L. Finally, the Terrebonne subsegment, which is furthest from the Mississippi River discharge, had the lowest number of significant haloclines in the data and was found to be fully supporting the DO criterion with only 6.0% of DO readings below 5.0 mg/L.

Due to the high freshwater input from the Mississippi River, the Mississippi coastal subsegment experienced the most pronounced salinity gradients, ranging from near 0.2 ppt at the top of the water column to 38.2 ppt near the bottom. This occurred across all sites and dates. For a single site and date within the subsegment, the greatest range was from 0.4 ppt near the top to 37.9 ppt near the bottom in water approximately 7.0 m deep. This occurred on March 24, 2015. The corresponding DO concentrations ranged from 0.1 mg/L near the bottom to 9.7 mg/L at a depth of 1 m. The sample date of March 24, 2015 also corresponded with nearly the highest discharge rate from the river for 2015.

While more investigation is needed on the mechanics and variability of halo/pycnocline development, it appears that the Mississippi River, through both discharge flow and distance from the subsegments, has a large effect on the establishment of strong haloclines. Strong haloclines in turn have a large effect on the resulting low DO readings near the bottom of the water column.

In addition to DO and salinity, Figures 3.2.2 – 3.2.7 also show density as Sigma-t. Density Sigma-t is a calculated value that takes into account the temperature, salinity, and pressure of a water

sample at the time of sampling. The density for the majority of the samples strongly track the corresponding salinity, indicating that salinity was the primary driver of the stratification of nearshore waters during this study. Based on this relationship, salinity and density are believed to be strong components among the causes for low DO at greater depths when a halo/pycnocline is established.

Across all three subsegments and all dates, nine of twelve sampling events (runs) resulted in DO values < 5.0 mg/L. During one of these nine runs only one of eight sites had DO values < 5.0 mg/L. This occurred in the Terrebonne coastal subsegment on June 19, 2015. That one site had two results < 5.0 mg/L but $\geq$ 4.3 mg/L. A slight but apparent halocline effect was seen. All other sites that day had relatively uniform salinity from top to bottom at approximately 18-20 ppt. The remaining three sample runs without DO values < 5.0 mg/L occurred in January (Barataria), March and November (both Terrebonne).

While more investigation is needed, this halocline/pycnocline stratification is believed to be caused in part by differences in wind and wave patterns at the surface. In many cases, when the halocline was evident surface conditions were relatively calm, resulting in less mixing of the water column, particularly at greater depths. When no halocline was evident surface water conditions tended to be rougher, with higher seas. For example, on the last sample collection date of November 24, 2015 seas were reportedly running at six to eight feet, much rougher than normal. During that time, no halocline was noted and all DO results were > 7.0 mg/L. Another component under investigation is the effect of tidal period on the establishment of haloclines. There is some evidence that during periods of high tidal movement, both rising and falling tides, there were fewer strong haloclines and, therefore, fewer cases of low DO below the surface waters. By contrast, during periods of slack tide, both high and low tides, there appears to be more opportunity for strong haloclines to set up in the water column. Both meteorlogical and hydrographic components will be further developed in the final report on the Gulf DO study. Nutrient concentrations are likely to be another factor in the DO concentrations found during the study; however, nutrients were not sampled as part of this study.

**Figure 3.2.2.** Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Barataria Coastal subsegment (LA021102_00) on April 23, 2015. Not supporting DO with 42.9% below 5.0 mg/L criterion.

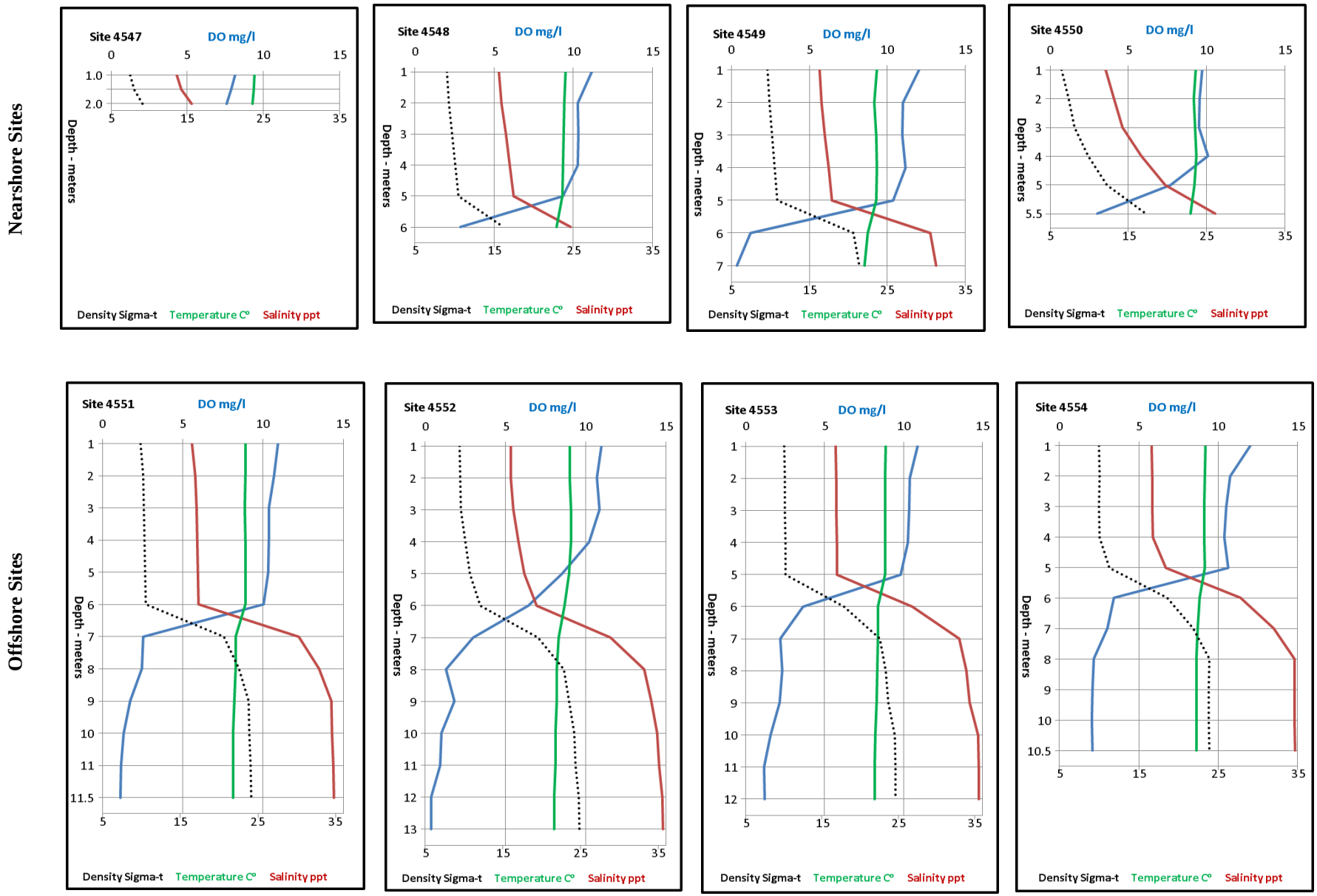


**Figure 3.2.3.** Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Barataria Coastal subsegment (LA021102_00) on January 29, 2015. Fully supporting DO criterion with 0% below 5.0 mg/L criterion.

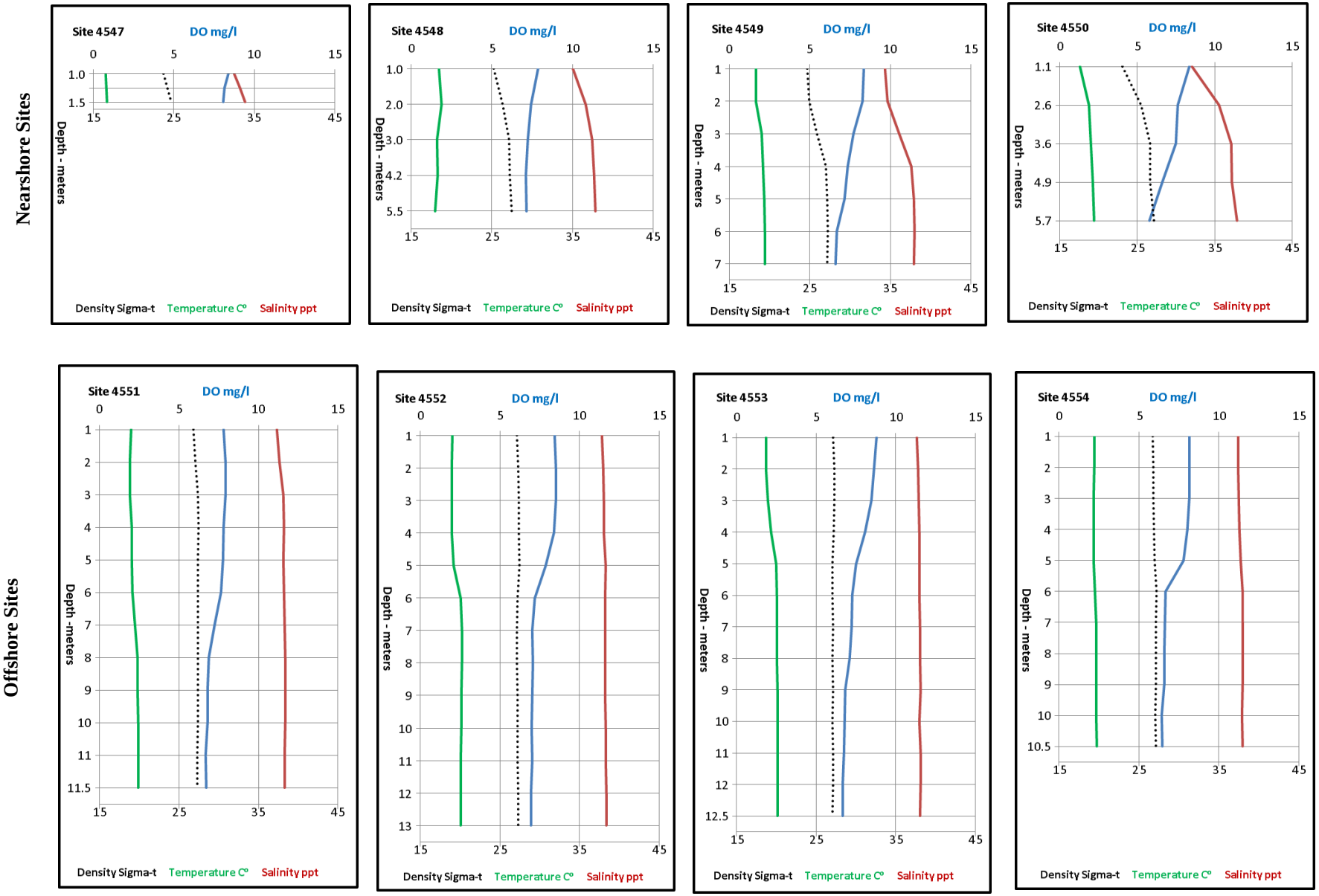


**Figure 3.2.4.** Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Mississippi Coastal subsegment (LA070601_00) on March 24, 2015. Not supporting DO with 64.1% below 5.0 mg/L criterion.

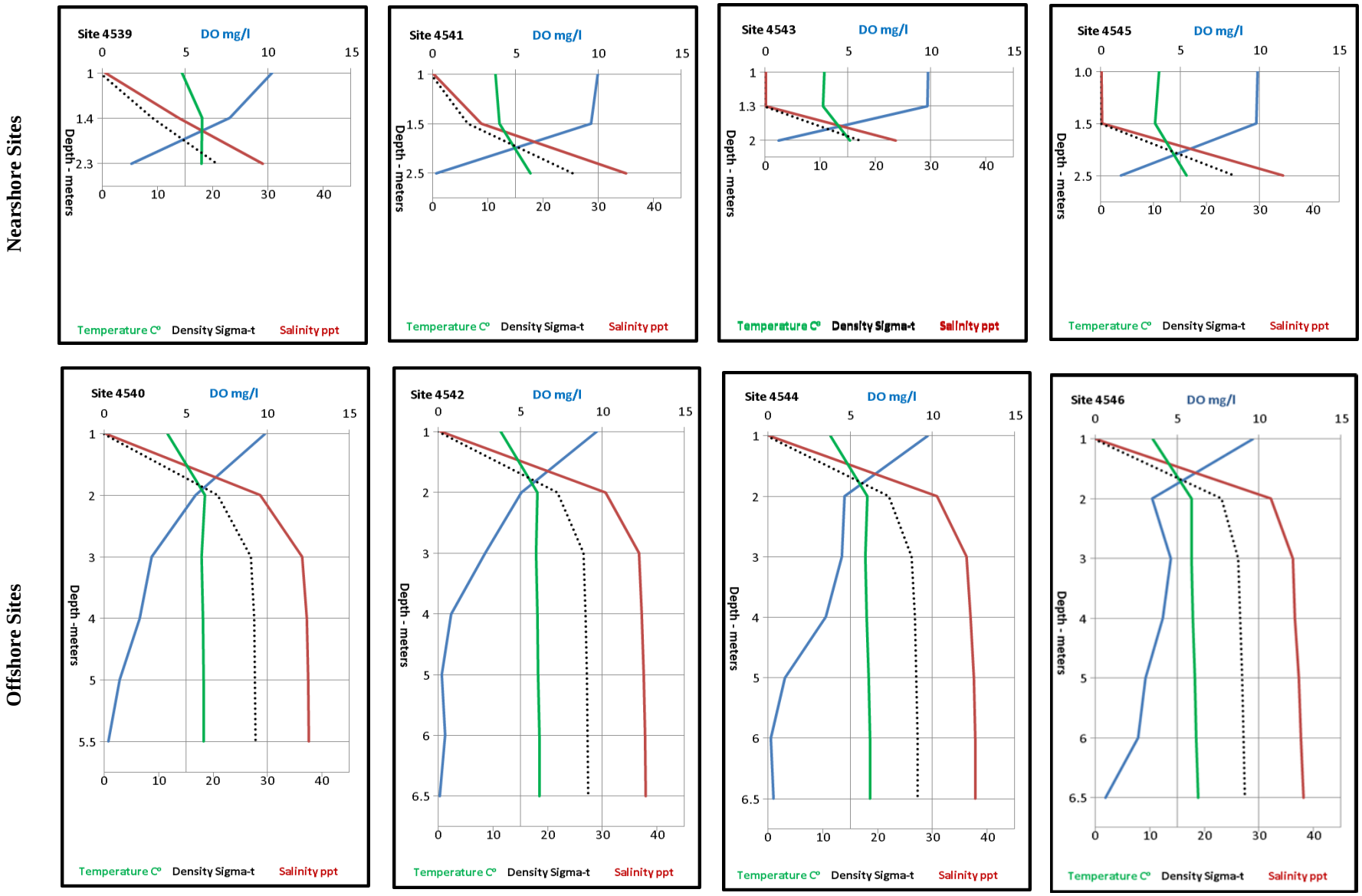


**Figure 3.2.5.** Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Mississippi Coastal subsegment (LA070601_00) on June 30, 2015. Not supporting DO with 15.0% below 5.0 mg/L criterion.

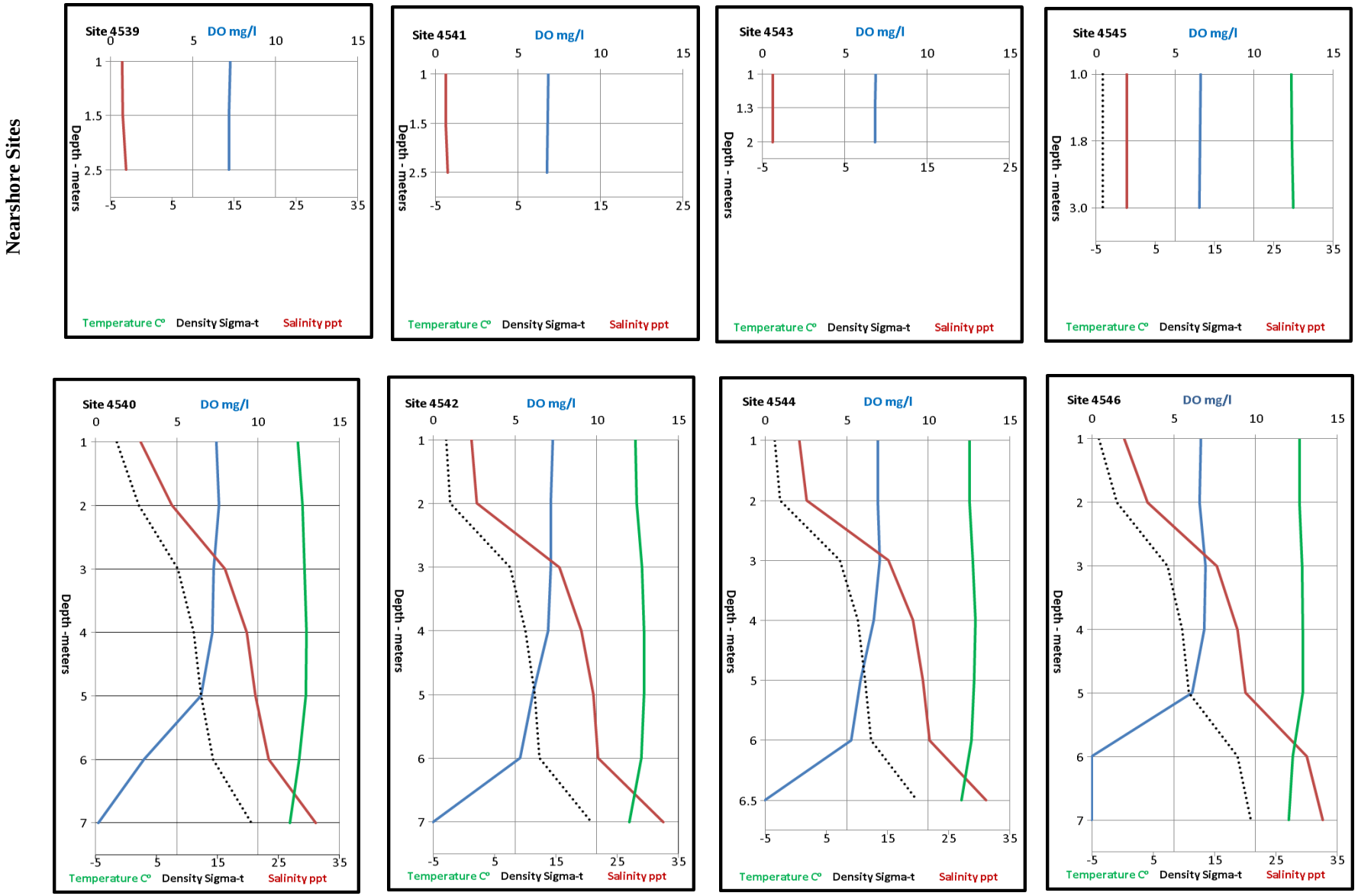


**Figure 3.2.6.** Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Terrebonne Coastal subsegment (LA120806_00) on August 14, 2015. Not supporting DO with 18.9% below 5.0 mg/L criterion.

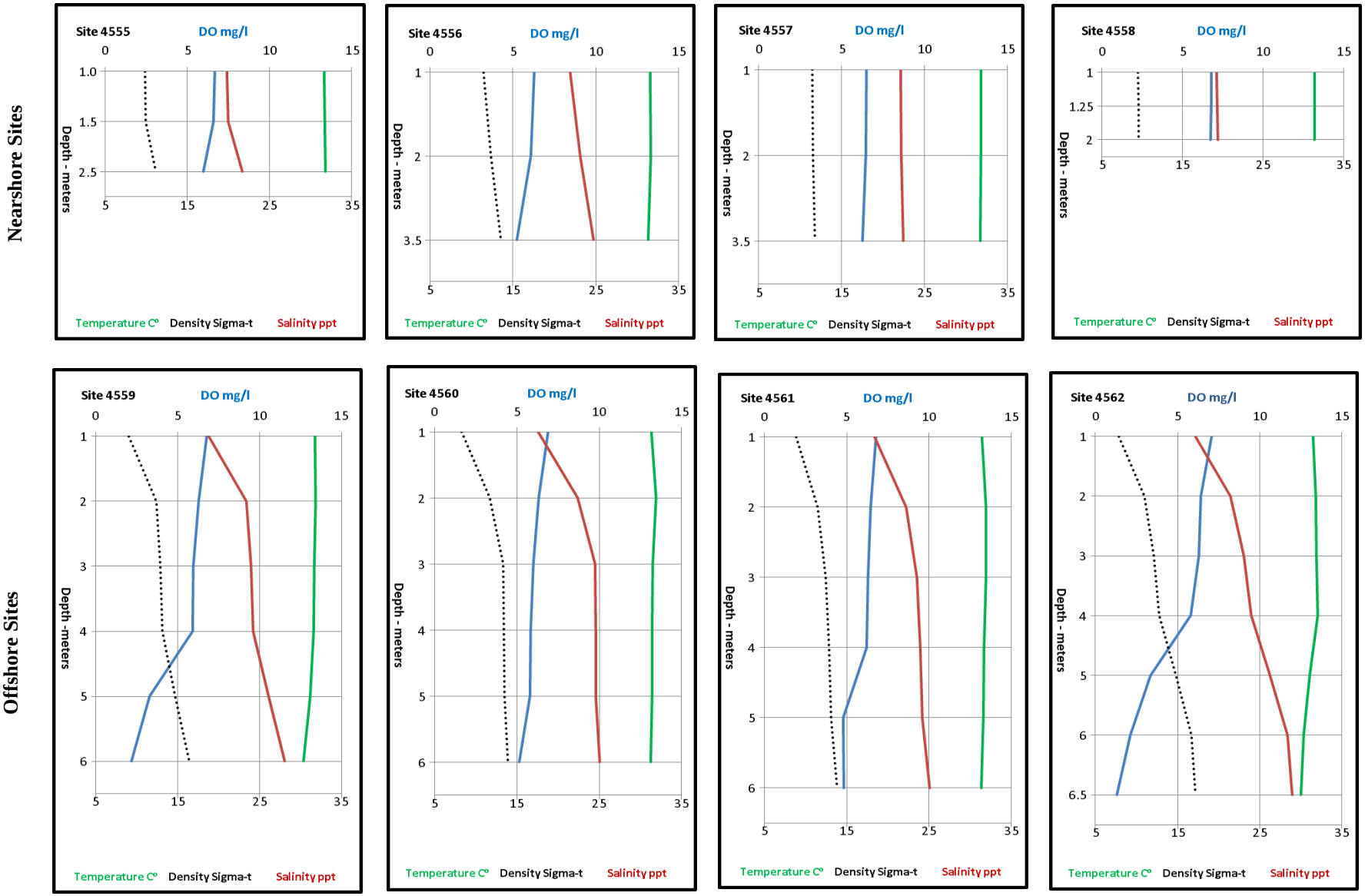
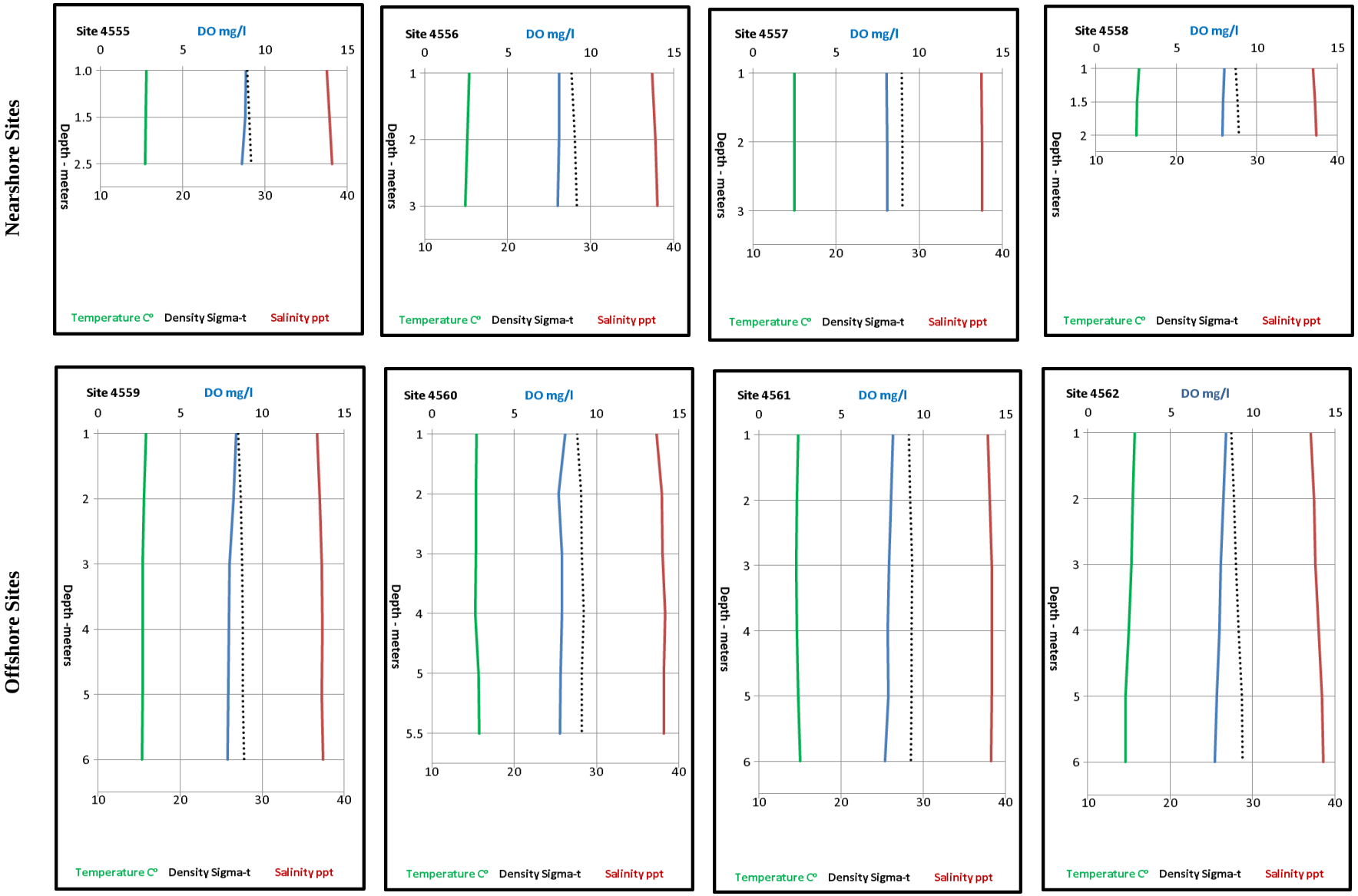


**Figure 3.2.7.** Dissolved oxygen, salinity, temperature, and density sigma-t vs. depth below surface in the Terrebonne Coastal subsegment (LA120806_00) on March 2, 2015. Fully supporting DO with 0.0% below 5.0 mg/L criterion.



## Rationale for Not Using Readily Available Data and Information

In accordance with LDEQ's QAPP for the AWQMN (LDEQ 2017b) approved by USEPA-Region 6, LDEQ required at least five data points for parameters collected monthly and a minimum of three data points for parameters collected quarterly; otherwise, insufficient data were available for assessment purposes. LDEQ conducted additional evaluations of data sets to determine usability in accordance with standard operating procedures for the IR (LDEQ 2017a) and data quality objectives outlined in the QAPP cited above. Data quality issues that may have necessitated qualifications to data sets resulting in limited and/or no usability include, but are not limited to: limited geospatial data and/or representativeness; limited temporal data and/or representativeness; limited quality control data; and quality control data indicating data that are of limited use (e.g., blank contamination, incorrect laboratory procedures).

## Good Cause for Not Listing Waters

In accordance with CWA § 303(d) and federal regulations, LDEQ listed waters as impaired and requiring TMDL development (IRC 5, IRC 5RC, and IRC 5-Alt; see Table 3.2.1) if sufficient data of appropriate quality were available. Conversly, if insufficient data was available through LDEQs ambient water quality monitoring or other sources, then the water body was reported as unassessed or prior IR assessments were carried forward.

## Use of Flow Rating for Assessments

As part of its ambient water quality monitoring program LDEQ includes a qualitative flow rating, which is recorded at the time water quality samples and meter readings are collected. LDEQ's flow ratings are found in Table 3.2.11. For the 2016 IR flow ratings of "no flow" were identified and evaluated to determine if the "no flow" rating may have impacted the water quality samples used for the report. "No flow" was reported for 175 samples at 57 sites. After reviewing the sites in question it was determined that low or no flow conditions are a common occurence for all of the streams. Therefore, no water quality data was rejected for use in the 2018 IR.

**Table 3.2.11.**

Flow severity ratings for suitable streams in Louisiana's ambient water quality monitoring network.

| LDEQ Flow Code | LDEQ Flow Description |
|---|---|
| 0 = Not Applicable | Used for lakes, estuaries, bays with no normal flow or only tidal flows. |
| 1 = Dry | Streambed is completely dry with no visible pools. |
| 2 = Intermittent | Streambed has water visible in naturally occurring isolated pools. |
| 3 = No Flow | Streambed has water from bank to bank but flow is not detectable. |
| 4 = Low Flow | Flows are detectable. |
| 5 = Normal Flow | Flows greater than low flow but stay within the stream channel. |
| 6 = High Flow | Flows that leave the normal stream channel but stay within the stream banks. |
| 7 = Flood | Flows that leave the normal confines of the stream channel and move out on to the flood plain over the stream bank (either side of the stream). |

## Suspected Sources of Impairment

In addition to the use of water quality data in making assessments, LDEQ, OEC, SD staff familiar with local watershed conditions and activities provide input regarding significant suspected sources of impairment. Surveillance Division staff also provide input in cases where natural sources were potentially causing criteria exceedances. In such cases, LDEQ will evaluate the need for a UAA or other water quality survey for potential criteria revision. Suspected sources for all water body impairment combinations are not required at this stage of IR development but will be provided in the final 2018 Integrated Report.

## Integrated Report Category Determination

LDEQ made a preliminary determination of IR categorization (Table 3.2.1) based on statistical assessment of criteria exceedances and subsequent determination of a water body's designated use support (Table 3.2.2). LDEQ used additional information such as previous TMDL development (IRC 4a), insufficient data determinations (IRC 3), environmental events (e.g., droughts, severe weather, oil spill) (IRC 3 or 4b), remediation activities (IRC 4b), and suspected sources of impairment to determine appropriate IR categories. Multiple IR categories may be assigned to a single subsegment which has multiple criteria for multiple uses.

IR Category 3 was used for selected subsegments with potential nutrient enrichment concerns but which did not already have a TMDL developed. Listings for nitrate/nitrite nitrogen and total

phosphorus were historically based on evaluative assessments. However, the evaluative assessments were based on best professional judgment with no numeric nutrient criteria basis. LDEQ is currently coordinating with USEPA to collect data that will inform the nutrient criteria development process and allow more appropriate assessments in the future.

## Total Maximum Daily Load Prioritization

The CWA § 303(d) Program provides a mechanism for integration of implementation efforts to restore and protect the nation's aquatic resources. Through this process the nation's waters are assessed, restoration and protection objectives are systematically prioritized, and TMDLs and alternative approaches are adaptively implemented to achieve water quality goals with collaboration of State and Federal agencies, tribes, the regulated community, and the public. A long-term vision has been described whereby states may identify and prioritize water bodies for these restoration and protection efforts under the § 303(d) Program (USEPA 2013). The primary goals of this long-term vision include prioritization, assessment, protection, alternatives, engagement, and integration.

This long-term vision requires that states establish a prioritization framework by which the states will establish a list of priority watersheds to be addressed during the period FY2016-FY2022. LDEQ developed such a framework and solicited public feedback. Comments received were considered during the development of the final list of priority watersheds. The prioritization framework was made available to the public via LDEQ's website at: http://deq.louisiana.gov/page/clean-water-act. Electronic notices were sent out via Louisiana's electronic notification system.

In addition to conducting a public review of the prioritization framework, LDEQ delivered presentations at various conferences and workshops to inform stakeholders and the public. LDEQ also met with various state agencies, local governments, and watershed-based organizations. LDEQ commits to continuing engagement with stakeholders and the general public as it investigates and develops watershed protection and/or restoration plans in the priority watersheds. The updated list of priority watersheds is listed below in Table 3.2.12.

**Table 3.2.12.**

List of § 303(d) vision priority watersheds for the period FY2016 – FY2022.

| Projected Completion Year | Subsegment | Waterbody Name | Projected Plan Type | Target Percentage |
|---|---|---|---|---|
| 2018 | LA070505_00 | Tunica Bayou – from headwaters to Mississippi River | TMDL Alternative | 7 |
| 2019 | LA040504_00 | Yellow Water River – from headwaters to Ponchatoula Creek | TMDL Alternative | 10 |

**Table 3.2.12.**

List of § 303(d) vision priority watersheds for the period FY2016 – FY2022.

| Projected Completion Year | Subsegment | Waterbody Name | Projected Plan Type | Target Percentage |
|---|---|---|---|---|
| 2020 | LA040503_00; LA070501_00 | Natalbany River – from headwaters to Tickfaw River; Bayou Sara – from Mississippi state line to Mississippi River | TMDL Alternative | 51 |
| 2021 | LA040403_00 LA040401_00 | Blind River - from headwaters to Amite River Diversion Canal; Blind River – from Amite River Diversion Canal to mouth at Lake Maurepas | TMDL Alternative | 85 |
| 2022 | LA040404_00 | New River – from headwaters to New River Canal | TMDL Alternative | 100 |

LDEQ expects that alternative plans are the most appropriate means to achieve the water quality standards since the impairment issues are likely caused by conditions outside the regulatory impacts of traditional TMDLs. Such conditions may include nonpoint source loads (including individual treatment units in unsewered areas), unpermitted dischargers, or permitted dischargers that are not meeting the limits provided in the current permit limits.

LDEQ anticipates that, in general, the alternative plans may include the tasks listed below. The actual plans may vary on a case-by-case basis based on the conditions and characteristics of the individual water body.

General Alternative Plan Structure

1. Investigative activities
    a. Water body monitoring
    b. Discharger inventory review
    c. Loading estimations (as needed based on the appropriate available data)
    d. Facility inspections
    e. Individual unit inspections
    f. Work with local stakeholders, governments, & organizations
        i. Education and outreach
    g. Pre-plan monitoring
2. Plan development
3. Implementation
    a. Assist local stakeholders, governments, & organizations
        i. Education and outreach
        ii. Development of ordinances as needed
        iii. Regionalization
    b. Implementation of BMPs
    c. Assist with required upgrades for

        i. Permitted
        ii. Unpermitted facilities (acquire permits)
        iii. Individual homes
    d. Compliance schedules/orders, penalties (as needed)
    e. Monitoring during implementation
4. Post-plan implementation monitoring

LDEQ has identified several potential partners to assist in activities conducted in the priority watersheds, including but not limited to:

1. United States Environmental Protection Agency (USEPA);
2. United States Geological Survey (USGS);
3. the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS);
4. the Louisiana Department of Health (LDH);
5. the Louisiana Department of Agriculture and Forestry (LDAF);
6. the Louisiana Department of Wildlife and Fisheries (LDWF);
7. the Louisiana Department of Natural Resources (LDNR);
8. the Coastal Protection and Restoration Authority (CPRA);
9. the Lake Pontchartrain Basin Foundation (LPBF);
10. the Louisiana Conference;
11. universities
12. local governments;
13. local watershed-based organizations; and
14. local watershed coordinators currently under LDEQ contract.

Funding is expected to be provided by various sources. The primary sources are expected to be performance partnership grants, § 106 grants (pollution control), § 319 grants (nonpoint source management), and the State Revolving Loan Fund. Additional funding or other assistance may be provided by partnering agencies and organizations. Monitoring will be conducted to evaluate the progress of each individual plan. Ambient monitoring may serve as the primary source of monitoring, with additional monitoring conducted as needed. Plans will be adaptively managed to allow for necessary updates or changes in conditions. Plans will also be reviewed periodically to determine if the activities are being effective or if changes are needed and ensure that activities are being conducted appropriately.

All water body impairment combinations in IRCs 5 or IRC 5RC and not previously identified under the § 303(d) Vision protocols were prioritized as follows:

- WICs listed in IRC 5 with drinking water source or oyster propagation designated uses with suspected impairments due to fecal coliforms or organic compounds were given medium priority.
- WICs listed in IRC 5 with suspected impairments due to fecal coliforms or organic compounds in subsegments *without* drinking water source or oyster propagation designated uses were assigned low priority for TMDL development.
- WICs listed in IRC 5RC were assigned low priority for TMDL development to allow LDEQ time to evaluate the need for updated criteria.

- WICs listed in IRC 5 based on LDH beach monitoring data for enterococci bacteria impairments were assigned low priority to allow LDEQ time to coordinate with USEPA on source and epidemiological studies.
- WICs listed in IRC 5 for the following suspected impairments were assigned low priority due to the non-critical nature of the impairments or due to uncertainty regarding the validity of the suspected impairment (e.g., natural conditions, lack of apparent anthropogenic sources, sources outside the scope of TMDL development):
    - Low or high pH
    - Metals
    - Chlorides, sulfates, total dissolved solids
    - Temperature
    - Turbidity
    - Mercury in fish tissue (primary source is regional/global atmospheric deposition)
- All other WICs not previously mentioned were assigned low priority.

## Summary

The 2018 IR § 303(d) list represents a compilation of primarily four different sources of information: (1) the 2016 IR; (2) new data assessments for all 12 Louisiana basins with monitoring data (internal and external) between October 2013 and September 2017; (3) all recent TMDL activities occurring during or after development of the 2016 § 303(d) list; and (4) current fish consumption and swimming advisories in Louisiana. It is important to note that removal of a water body from the § 303(d) list, for any reason, does not remove water quality protections from that water body. All water bodies in Louisiana, § 303(d) listed or not, are subject to the same protections under federal and state laws and regulations, in particular the CWA and Louisiana's surface water quality standards (LAC 33:IX.Chapter 11). LDEQ will continue to monitor and assess the quality of Louisiana's waters; permitted facilities are subject to conditions of their permits; unpermitted point source dischargers are required to obtain a permit or face enforcement actions; violators of permit conditions are subject to enforcement action; and contributors to nonpoint sources of pollution are encouraged to follow BMPs as developed by LDEQ's Nonpoint Source Program and its many collaborators.

## Integrated Report Category 4b Documentation

### Introduction

Integrated Report Category 4b (Table 3.2.1) was used for WICs where a TMDL is not required or appropriate as a corrective mechanism for improving water quality. USEPA requires well documented justification for placement of a WIC in IRC 4b. The following sections outline the water bodies and subsegments categorized as IRC 4b and information to address EPA's six factors to provide sufficient documentation to place in 4b (USEPA 2002, USEPA 2005, USEPA 2006).

## Bayou Bonfouca, Subsegments LA040907_00 and LA040908_00

### 1) Identification of Subsegment and Statement of Problem Causing Impairment

***Subsegment Description***

Bayou Bonfouca (subsegments LA040907_00, Hydrological Unit Code (HUC) 08090201 and LA040908_00, HUC 08090201) is a navigable waterway in St. Tammany Parish in southeastern Louisiana. It flows south for seven miles into Lake Pontchartrain.

***Impairment and pollutant causing impairment***

Bayou Bonfouca is listed in Louisiana's 2018 Water Quality IR as not fully supporting the primary contact recreation designated use as a result of suspected benzo(a)pyrene (PAHs) impairments. In 1987, LDH and LDEQ issued an advisory against swimming in and consumption of fish from Bayou Bonfouca (revised 1998). Bayou Bonfouca is currently under an informational health advisory for no swimming or sediment contact (see http://deq.louisiana.gov/assets/docs/Water/Mercury-FishConsumptionAdvisoryTable.pdf and also http://new.dhh.louisiana.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/ChemAdvisories2016.pdf).

***Sources of pollutant causing impairment***

In 1970, several thousand cubic yards of creosote spilled into Bayou Bonfouca and onto an adjacent land area following a fire and tank explosion at the American Creosote Works plant. The creosote plant had been operating for almost 100 years prior to its closure after the fire. The site is within the designated 100-year flood plain of the bayou. Legacy contamination is summarized at: http://www.epa.gov/region6/6sf/pdffiles/bayou-bonfuca-la.pdf.

In 1976, the U.S. Coast Guard undertook an investigation of the Bayou Bonfouca waterway. This was supplemented by another study in 1978 by USEPA, the U.S. Coast Guard, and NOAA. Principal pollutants found at the site were creosote compounds, chemicals composed mostly of PAHs and commonly used as wood preservatives.

Bayou Bonfouca received final placement on the USEPA Superfund National Priorities List (NPL) in 1983 as a result of contamination by creosote. The NPL is a list of hazardous waste sites eligible for investigation and cleanup under the federal Superfund Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program. Approximately 1.5 miles of Bayou Bonfouca were left biologically sterile due to severe creosote contamination. The Bayou Bonfouca Superfund site, located in Slidell, Louisiana on the north shore of Lake Pontchartrain, includes the former American Creosote Works Plant and a portion of Bayou Bonfouca. Bayou Bonfouca forms the southern boundary of the site. Subsegments LA040907_00 and LA040908_00 were on the 1998 and 1999 court-ordered § 303(d) lists and subsequently on the 2002 Consent Decree § 303(d) List for priority organics and other impairments.

### 2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

***Water quality target***

Since impairment of Bayou Bonfouca is based on an informational health advisory issued by LDH for no swimming or sediment contact, the water quality target will be achieved when the informational health advisory is rescinded.

***Controls that will achieve Water Quality Standards***

Beginning in January 1996, USEPA and LDEQ initiated work to correct the contamination at the Bayou Bonfouca Superfund site, including Bayou Bonfouca, under provisions of the federal Superfund program. USEPA and LDEQ jointly provided funds for cleanup of the site, with USEPA as lead agency in charge of remediation. Remediation of the abandoned facility involved the dredging of over 170,000 cubic yards of contaminated sediments from Bayou Bonfouca and removal of 8,000 cubic yards of surface waste materials. The selected remediation and disposal methods for the contaminated site included: excavation; capping the site; incineration of creosote waste piles and heavily contaminated bayou sediment; and pumping, treating, and monitoring contaminated groundwater. A design phase for groundwater remediation was completed in October 1989, and the *in situ* operation began in mid-1991. In November 1993, a cleanup contractor moved an incinerator to the site and completed a trial burn. In early 1994, excavation and incineration of the contaminated sediments was initiated. The ash was placed under a Resource Conservation and Recovery Act (RCRA) landfill cap onsite, and incineration was completed in the summer of 1995. No further surface water remediation is expected.

The second phase of remediation addresses dense nonaqueous phase liquids in the surficial aquifer. A statutory Five-Year Review Report of groundwater cleanup activity was completed in September 1996 (http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3513215&ob=yes&child=yes). Recommendations included continued groundwater recovery and treatment and an evaluation of treatment performance. In September 1997, USEPA made modifications in the groundwater recovery and treatment process to protect the integrity of the Source Control remedy based on a Performance Evaluation Report. In the spring of 2000, additional groundwater remedial activity began, and additional groundwater recovery wells were installed.

***Descriptions of requirements under which pollution controls will be implemented***

A Record of Decision (ROD) signed in March 1987 outlined a selected remediation plan for the Bayou Bonfouca Superfund site including bayou dredging, onsite incineration, and groundwater treatment. In June 1988, it was discovered that the extent and depth of the contamination was greater than previously estimated. The original ROD was amended under the "February 1990 Explanation of Significant Difference" (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=542710&ob=yes&child=yes).

On July 10, 2001, a second Five-Year Review Report was signed by USEPA (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3513177&ob=yes&child=yes), and LDEQ took over operations and maintenance at the site. As of December 2017, the Bayou Bonfouca site was in the continuing Operation and Maintenance phase of remediation. Under this phase, groundwater pumping and monitoring will continue for the foreseeable future. Remediation activity documents are available in LDEQ's EDMS, including:

- Final Operation and Maintenance Plan Bayou Bonfouca Superfund Site, Slidell, Louisiana: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10353482&ob=yes&child=yes
- Document ID 1496071 – Final Operation and Maintenance Addendum Bayou Bonfouca Superfund Site, Slidell, Louisiana: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=1496071&ob=yes&child=yes

- Document ID 2186669 – Final Field Sampling Plan: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=2186669&ob=yes&child=yes
- Document ID 671442 – Final Design: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=671442&ob=yes&child=yes
- Document ID 2186671 – Final Contractor Quality Control Plan: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=2186671&ob=yes&child=yes
- Document ID 9027498 – Quality Assurance Project Plan for Operations and Maintenance: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9027498&ob=yes&child=yes

**3) Estimate or Projection of the Time When Water Quality Standards Will Be Met**

Between January 2001 and April 2011, LDEQ conducted routine ambient water quality sampling on Bayou Bonfouca at site 0301 in Slidell (approximately one mile downstream from the remediation area) and site 1078 (approximately 4.4 miles downstream from the remediation area). During this sample period, 31 organic compounds were analyzed resulting in 638 analytical results. Of these samples, only six results were above detection levels. The parameters detected included: chloromethane (two detections), toluene (one detection), and methylene chloride (three detections). None of the detections exceeded LDEQ's water quality criteria. All other results were at or below detection levels.

In addition, a review of USEPA's online Superfund Information System found that none of the contaminants in question were reported to be of concern in surface water or terrestrial areas of the Bayou Bonfouca site. The next five-year review of the site is scheduled for September 2021. More information can be found on the EPA website, available at: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0600574.

**4) Schedule for Implementing Pollution Controls**

As of December 2017, the Bayou Bonfouca site was in the continuing Operation and Maintenance phase of remediation. USEPA and LDEQ continue to review the operation and maintenance of the groundwater pumping and treatment of creosote oil. Under this phase, groundwater pumping and monitoring will continue for the foreseeable future. The groundwater treatment continues to reduce the volume of contaminated groundwater and prevent migration.

**5) Monitoring Plan to Track Effectiveness of Pollution Controls**

Monthly operational reports are submitted to USEPA for review and comment (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10888092&ob=yes&child=yes) for the latest monthly report—October 2017). LDEQ will continue routine surface water quality monitoring of Bayou Bonfouca to ensure protectiveness of remedial actions.

**6) Commitment to Revise Pollution Controls, As Necessary**

LDEQ Water Quality Program is committed to continuing ambient water quality monitoring as part of the routine monitoring program. In addition, LDEQ Remediation Services is committed to the continuing Operation and Maintenance phase of remediation as outlined in the July 2016 Five-Year Review Report (available at https://semspub.epa.gov/work/06/500023187.pdf). The sixth five-year review is scheduled to be completed in 2021.

## Bayou Olsen/Olsen Bayou, Subsegment LA030304_001

### 1) Identification of Subsegment and Statement of Problem Causing Impairment

***Subsegment Description***

Bayou Olsen/Olsen Bayou (subsegment LA030304_001, HUC 08080206), is located in southwestern Louisiana and is located within the zone of tidal influence of the Gulf of Mexico. Bayou Olsen is approximately 0.5 mile long and lies within a larger water quality subsegment, Moss Lake (subsegment LA030304_00, HUC 08080206). Bayou Olsen is a tributary of Moss Lake.

***Impairment and pollutant causing impairment***

Bayou Olsen LA030304_001 is listed as impaired in Louisiana's 2018 Water Quality IR based on an LDEQ and LDH swimming advisory limiting primary contact recreation. Bayou Olsen is listed as not fully supporting the Primary Contact Recreation and Fish and Wildlife Propagation designated uses as a result of 1,1,2-trichloroethane, 1,2-dichloroethane, and chloroform. In 1989, LDEQ and LDH issued an advisory against sediment contact and for fish/shellfish consumption limits (reviewed 1994, see http://deq.louisiana.gov/assets/docs/Water/Mercury-FishConsumptionAdvisoryTable.pdf and also http://new.dhh.louisiana.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/ChemAdvisories2016.pdf).

***Sources of pollutant causing impairment***

Adjacent to Bayou Olsen is the Carlyss Pit Remediation Site. The site was owned and operated by an independent disposal company from the late 1950s to 1971. During that time, waste materials, primarily liquid chlorinated hydrocarbons (LCH), were taken to the site and burned. Burning operations were subsequently discontinued, and the site was used for disposal of liquid wastes in surface impoundments or "ponds." In the past, Bayou Olsen received overflow from the waste ponds, which are located east of Highway 27 and 8.5 miles south of Sulphur, Louisiana.

VOCs were detected in Bayou Olsen sediments adjacent to the Carlyss Pit site. However, 2006 baseline surface water monitoring of Bayou Olsen implemented according to the LDEQ-approved Remedial Project Plan (RPP) for this site failed to demonstrate detectable levels of VOCs in the water column. Sampling was repeated in 2013 as described in *Bayou Sediments Area of Interest (AOI) Monitoring Report for 2013 Carlyss Pit #1 Site, Carlyss, Louisiana AI #7836* (Geosyntec, January 15, 2014, available at: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9161181&ob=yes&child=yes). This data supports the continued absence of site-related surface water impacts to Bayou Olsen from cross-media transfer of VOCs from the sediments.

Groundwater monitoring was approved by LDEQ July 21, 2015, in which installation of monitoring wells were authorized as described in the *Work Plan for Phytoremediation Pilot Test and Installation of Off-Site Monitoring Wells for Milestone 1 Groundwater and Contributing Subsurface Soils AOI, Carlyss Pit #1, Site AI#7836* (Geosyntec, August 6, 2015 http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9894996&ob=yes&child=yes).

Although sediment deposition appears to be occurring adjacent to the berm and the top six inches of sediment in this area meet the Remedial Criterion, it was recommended in *Bayou Sediments AOI Monitoring Report for 2015* (Geosyntec, January 4, 2016, see

http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10047586&ob=yes&child=yes) that potential alternatives be evaluated to increase the protectiveness of the remedy given the recent trend in sediment VOC concentrations at transect BL1. The Companies developed a plan for additional bayou-related activities to address this trend, including additional sampling as appropriate, and submitted the plan to LDEQ on April 4, 2016 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10152206&ob=yes&child=yes). Sediment characterization activities that were conducted to address these recommendations concluded that the increasing trend appeared to have reversed and declined since 2015 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10286481&ob=yes&child=yes).

**2) Description of Pollution Controls and How They Will Achieve Water Quality Standards**

***Water quality target***

For the primary contact recreation designated use, LAC 33:IX:1113.C Table 1 specifies a 1,1,2-trichloroethane criterion of 6.9 µg/L for non-drinking water supply and a 1,2-dichloroethane criterion of 6.8 µg/L for non-drinking water supply.

For chloroform, LAC 33:IX:1113.C Table 1 specifies a criterion of 70 µg/L for non-drinking water supply to protect for primary contact recreation.

For aquatic life protection, LAC 33:IX:1113.C Table 1 specifies 1,1,2-trichloroethane criteria of 1,800 µg/L (acute) and 900 µg/L (chronic) for freshwater and brackish water; LAC 33:IX:1113.C.Table 1 specifies 1,2-dichloroethane criteria of 11,800 µg/L (acute) and 5,900 µg/L (chronic) for freshwater and 11,300 µg/L (acute) and 5,650 µg/L (chronic) for marine and brackish water.

For chloroform, LAC 33:IX:1113.C Table 1 specifies criteria of 2,890 µg/L (acute) and 1,445 µg/L (chronic) for freshwater and brackish water and criteria of 8,150 µg/L (acute) and 4,075 µg/L (chronic) for marine water to protect aquatic life.

Water column results since at least 2006 have shown no detectable levels of VOCs in the Bayou Olsen water column; however, the advisory issued by LDH remains in place. Additional sediment sampling and communication between LDEQ and LDH will be required to lift the LDH advisory and remove these compounds as suspected causes of impairment.

***Controls that will achieve Water Quality Standards***

Work began in June 1990 and was substantially completed by February 1992; approximately 1.5 million gallons of LCH were removed from the waste ponds. A Pond Closure Work Plan submitted to close the Carlyss Pit waste ponds was approved in May 1994. Work began in 1994 with the treatment of 6.9 million gallons of water from the Carlyss Pit waste ponds. Following water treatment, the waste ponds were filled with 185,000 cubic yards of clay and very low permeability soil. Subsequently the ponds were covered with clean topsoil, and vegetation was established. Natural attenuation of Bayou Olsen sediments was determined to be the best option for sequestration of remaining contaminants in the bayou. Reinforcement of the berm separating the former east pond from the bayou was completed in the fall of 2013.

***Descriptions of requirements under which pollution controls will be implemented***

An Interim Agreement was entered into by LDEQ on February 6, 1985 with Browning-Ferris Industries (BFI) and Conoco Inc. to perform work at the site. A preliminary Interim Remedial Action Plan was developed in August 1987 directing the companies to implement remedial

activities, including removal of LCH from Bayou Olsen. In February 1990, BFI and Conoco, Inc. submitted the LCH Reclamation Work Plan, which was approved by LDEQ.

A Pond Closure Certification Report was submitted to LDEQ in October 1995. In February 1998, LDEQ indicated all companies had met all requirements for remediation of the site (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=77580&ob=yes&child=yes).

LDEQ has approved a Monitored Natural Recovery as the remedy for the Bayou Sediments AOI (LDEQ letter dated November 30, 2007, available at: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=5985059&ob=yes&child=yes).

**3) Estimate or Projection of the Time When Water Quality Standards Will Be Met**

The Monitored Natural Recovery Remedy reduced potential ecological risks by allowing natural sedimentation to occur, thereby isolating the deeper sediments with higher concentrations of VOCs. Until data is available to indicate otherwise, LDEQ will continue to report this water body as impaired due to 1,1,2-trichlorethane, 1,2-dichloroethane, and chloroform. Future sampling data will be used to determine when the water body is fully supporting primary contact recreation uses.

**4) Schedule for Implementing Pollution Controls**

Remediation activities at the site have been completed.

**5) Monitoring Plan to Track Effectiveness of Pollution Controls**

Surface water monitoring is currently being implemented as described in the *Remedial Project Plan for Long-Term Monitoring of the Bayou Sediments AOI* (RPP, Geosyntec, March11, 2008, see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3412809&ob=yes&child=yes) that was approved by LDEQ in a letter dated April 9, 2008 (available at: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=3443861&ob=yes&child=yes).

In addition to annual site inspections, surface water sampling was initially planned biennially, subject to LDEQ-approved schedule modifications. Surface water sampling was conducted in 2017. The next bayou sampling event should be scheduled for 2019, since sampling is on a biennial schedule. According to the RPP of March 11, 2008, monitoring will be conducted until the remedial objectives for sediments have been attained and compliance with surface water quality standards demonstrated. Monitored Natural Attenuation continues to achieve protection of surface water and the area downstream of the former ponds, as the higher concentrations of site-related VOCs are remaining at depth and are overlain by cleaner accumulating sediment.

As discussed in the *Annual Groundwater Monitoring Report for* 2016 (Geosyntec, March 17, 2017 http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10553014&ob=yes&child=yes), ground water sampling was extended in 2017 as described in the *Work Plan Addendum: Zone III/IV Engineered Phytoremediation Pilot Test, Carlyss Pit #1, Site AI #7836* (Geosyntec, http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10574851&ob=yes&child=yes).

Until such time as the impairment can be removed, IRC 4b remains the most suitable classification for the water body due to the known nature of the impairment and the ongoing remediation inspection actions described above. The remediation site continues to be inspected

on an annual basis, and an Annual Corrective Action Plan (CAP) System Report is submitted to LDEQ. The most recent 2017 CAP report is available at: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10492301&ob=yes&child=yes.

**6) Commitment to Revise Pollution Controls, As Necessary**

No further controls are expected to be needed. As stated in the March 11, 2008 RPP, if monitoring results indicate that the remedial objectives will not be met or that the site is causing adverse impacts to the designated water use, then the [responsible parties] will review the cause for this and the appropriateness of the Monitored Natural Recovery Remedy and may propose enhancements or changes to the remedy, if required. All modifications to the RPP will be subject to LDEQ approval before implementation.

## Capitol Lake, Subsegment LA070503_00

**1) Identification of Subsegment and Statement of Problem Causing Impairment**

***Subsegment Description***

Capitol Lake (subsegment LA070503_00, HUC 08070201) is a small manmade lake formed between 1901 and 1908 when the lower reach of Grass Bayou was dammed approximately 0.25 mile east of the Mississippi River. The lake is located in downtown Baton Rouge adjacent to the State Capitol and the Governor's Mansion. It has a surface area of approximately 60 acres, and its depth varies from one foot in the northern arm to a maximum of eight feet in the southwestern arm. The average depth ranges between four and six feet. Capitol Lake drains an area of approximately 4.5 square miles, consisting primarily of residential, commercial and industrial land uses. The lake receives drainage from two unnamed canals, which are subsurface storm sewers in their upper reaches. At the southwest end of the lake, there is a pumping station, which is the only outlet for the lake. The East Baton Rouge City Parish government operates this pumping station. It is usually turned on only during storm events and discharges to the Mississippi River. Thus, Capitol Lake is a mostly stagnant system that is only flushed during storm events.

***Impairment and pollutant causing impairment***

Capitol Lake is listed in Louisiana's 2018 Water Quality IR as not fully supporting the fish and wildlife propagation use as a result of suspected impairment from PCBs. Capitol Lake is under a "no fish consumption" advisory issued by LDEQ and LDH (see http://deq.louisiana.gov/assets/docs/Water/Mercury-FishConsumptionAdvisoryTable.pdf and http://new.dhh.louisiana.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/ChemAdvisories2016.pdf). The advisory was initiated in 1983 due to the presence of PCBs in fish tissue, surface water, and sediments (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=7386802&ob=yes&child=yes). The advisory was reviewed in 1994 and again in 2017 and remains in effect. Additional information on Capitol Lake water quality can be found in LDEQ's EDMS at: http://edms.deq.louisiana.gov/app/doc/querydef.aspx, AI#5040 and AI#91420.

***Sources of pollutant causing impairment***

Pollutant sources to Capitol Lake include both point and nonpoint sources, specifically, discharges, spills and urban stormwater runoff. Investigations were conducted in Capitol Lake by LDEQ's predecessor agencies in 1972, 1973, and 1981 for oil contamination. In 1981, Kansas City Southern Railroad was found to be a significant source of pollution. Later,

enforcement actions against responsible industries were issued and corrective measures taken. However, oil and other pollutants continued to accumulate in the lake system, running off from urban surfaces such as streets, parking lots, gasoline stations, industrial and commercial facilities, and residences. In 1983, LDEQ's predecessor agency investigated a complaint concerning the discharge of oily wastes into the northern tributary of the lake system. The investigation revealed that oily wastewater, primarily from oil spillage and an underground storage tank leak, was draining into the canal from a Westinghouse Electric Corporation facility. Analysis of water samples revealed that PCBs were present in runoff water, canal water, and water from the center of the lake. PCBs were also found in fish tissue samples.

Investigation of other sources of pollution resulted in the issuance of enforcement actions and compliance orders requiring the cessation of discharge of oily waste or contaminated wastewater and control of discharges in excess of permit limits against Furlow-Laughlin Equipment Company Inc.; American Asphalt Corporation; City of Baton Rouge and Parish of East Baton Rouge; Comet Distribution Services Inc.; Kansas City Southern Railroad; and Road Runner Motor Re-builder Inc. It was also determined that none of the facilities were contributing PCBs. Other facilities that were possible sources of nonpoint PCB contaminated stormwater runoff from the storage of transformers, electric motors, and heavy equipment included the Louisiana Division of Administration Surplus Property Yard, U.S. Government Surplus Property Yard, and the Louisiana National Guard Armory, all located east of the lake.

**2) Description of Pollution Controls and How They Will Achieve Water Quality Standards**

***Water quality target***

For total PCBs, LAC 33:IX:1113.C.Table 1 specifies a freshwater chronic criterion of 0.0140 µg/L for aquatic life protection and a non-drinking water supply criterion of 5.61 x 10-5 µg/L to protect for primary and secondary contact recreation and fish consumption.

For PCBs in fish tissue, a final screening level of 270 µg/kg is suggested in Tissue Screening Level Guidelines for Issuance of Public Health Advisories for Selected Contaminants (March 2012, available at: http://deq.louisiana.gov/assets/docs/Water/Fish_Swim_Advisories/TSL_Documentation_March_2012.pdf).

***Controls that will achieve Water Quality Standards***

In 1985-86, Westinghouse complied with LDEQ's directive by removing PCB-contaminated soils from its property, installing a French drain system to contain groundwater contamination, and installing a stormwater culvert system through its property, allowing drainage canal stormwater to pass through without contacting PCB-contaminated soil.

Because concentrations of PCBs in the lake sediment are below the 50 ppm level required for designation as a hazardous waste site, Capitol Lake did not rank as a high priority for cleanup funding. Under the federal Superfund Program, this level of contamination is not considered an environmental emergency. Therefore, funding for cleanup has been from sources other than federal monies. Data indicate that the contaminated sediments do not pose a direct threat to the public or to area groundwater. However, the advisory on consumption of fish from the lake system remains in effect.

***Descriptions of requirements under which pollution controls will be implemented***

Analytical results confirmed that Westinghouse Electric Corporation was a major contributor of PCBs to the northern part of the lake. A compliance order was issued to Westinghouse

Electric Corporation requiring the facility to stop all oil-contaminated discharges, to submit plans for evaluation of the extent of PCB contamination in surface and subsurface soils at and surrounding the property, and for the removal and/or containment of PCB contamination (http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=4007642&ob=yes&child=yes). Westinghouse Electric Corporation signed a settlement agreement with LDEQ establishing the framework and timetable for cleanup and containment of PCB contamination at the facility and establishing an automatic monetary penalty system if the company failed to fulfill any provision (additional documents are available in LDEQ's EDMS, under AI#2056, (http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=4007634&ob=yes&child=yes).

In 1988, the Louisiana Legislature created the Capitol Lake Task Force with the purpose of studying and making recommendations on how to preserve and enhance the qualities of Capitol Lake. This task force found that Capitol Lake was seriously contaminated and requested that the governor create a commission to begin implementing the long-term solutions proposed by the Task Force.

In February 1991, an additional report on the chemical contamination of Capitol Lake sediments was submitted to LDEQ, including the conclusion that there was no additional PCB contamination. Later in this same month LDEQ's Inactive and Abandoned Sites Division issued compliance orders against Kansas City Southern Railroad and Louisiana Oil and Re-refining Company, Inc. The compliance orders required these companies to submit to LDEQ a work plan for remedial investigation and feasibility studies and to begin execution of the work plans no later than 90 days after approval of the plans. In May 1991, the Kansas City Southern Railroad was also issued a compliance order by LDEQ for violating its water discharge permit. In June 1992, LDEQ issued a "cease and desist" order shutting down the Louisiana Oil and Re-refining Company; the owner pleaded guilty to federal charges of conspiracy to illegally discharge pollutants. The owner was sentenced to prison and fined.

In 1993, because of the presence of PCBs in the lake, LDEQ initiated an extensive survey of Capitol Lake with the objectives of: (1) determining whether any exposure risk existed for people consuming fish from the lake system, (2) determining the extent and levels of contamination in the lake system, (3) determining any impacts upon the lake system's biological community, (4) confirming the extent and levels of contamination at the Westinghouse Electric Corporation facility, and (5) determining whether other sources of oil contamination were contributing PCBs to the lake system.

In January 1993, the governor signed an executive order creating the Governor's Commission on the Capitol Lake Rehabilitation Project and designated the LDEQ Secretary as chairman. LDEQ Office of the Secretary designed and conducted an environmental assessment of the Capitol Lakes system in 1997-1998. LDEQ collected and examined representative water, sediment, and fish tissue samples in sufficient quantity and quality to answer questions about human health risk posed by long-term exposure to toxic substances present in the lake system. The agency released a draft Risk Evaluation/Corrective Action Program (RECAP) risk assessment document in November 1998 that calculated and reported health risk. The health risk assessments included all possible pathways of human exposure to the constituents of concern at the concentrations found in the lake system's fish tissues and sediments. The RECAP risk assessment was amended, once in May 1999, and again in February 2000 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=4985478&ob=yes&child=yes). Each revision responded to issues that were raised during the review of the draft RECAP risk

assessment document. Through the risk assessment process for the lake system, LDEQ concluded that human health risks posed by exposure to the lake system, including consumption of edible fish, are within regulatory limits.

Composite fish samples were once again collected from Capitol Lake in July and September of 2017 for PCB congener and pesticide analysis. Sampling was conducted by staff from the Louisiana Department of Wildlife and Fisheries and the Louisiana Department of Environmental Quality. The Louisiana Department of Health conducted the risk assessment analysis of the data. As of this writing, the current no fish consumption advisory due to PCBs continues to be recommended. Pesticides were found to be below screening levels use by the responsible agencies.

**3) Estimate or Projection of the Time When Water Quality Standards Will Be Met**

In May 2002, LDEQ issued a statement of No Further Action, concluding that the Capitol Lakes system does not require any further management for protection of human health and environment. The June 17, 2002 decision documents are available at: http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=1224436&ob=yes&child=yes. Capitol Lake will continue to be reported as impaired on the IR until the "no fish consumption" advisory has been lifted.

**4) Schedule for Implementing Pollution Controls**

LDEQ has determined that no further pollution controls are needed.

**5) Monitoring Plan to Track Effectiveness of Pollution Controls**

LDEQ will continue to monitor Capitol Lake as part of the routine AWQMN. PCB sampling as part of the routine monitoring may take place as resources allow.

**6) Commitment to Revise Pollution Controls, As Necessary**

Based on the known nature of the suspected contamination and the LDEQ remediation decision reached on June 17, 2002, IRC 4b remains the most suitable classification for the 2018 Integrated Report. LDEQ will continue routine water quality monitoring of Capitol Lake as part of the AWQMN. New data will be used to reassess the water body in 2020. LDEQ will continue to work with LDH to determine if and when the advisory can be removed.

## Devil's Swamp Lake and Bayou Baton Rouge, Subsegment LA070203_00

**1) Identification of Subsegment and Statement of Problem Causing Impairment**

***Subsegment Description***

Devil's Swamp Lake (subsegment LA070203_00, HUC 08070201) is a manmade lake near Scotlandville in East Baton Rouge Parish, Louisiana. The lake was created in 1973 by excavation of borrow for construction of levees at the Baton Rouge Barge Harbor. The oxbow-shaped lake, which has an approximate surface area of 24 acres, is in a large flood plain area north of the city of Baton Rouge. Devil's Swamp Lake is surrounded by low-lying bottomlands and receives drainage from the adjacent swamp, Devil's Swamp. The swamps to the north and south of the lake are characterized by numerous small open ponds and water tupelo trees; surface water flow in the swamp is generally from north to south. The 262-acre swamp to the north of the lake extends approximately one mile to Devil's Swamp Lake. The 684-acre swamp to the south of the lake extends approximately 2.2 miles to the east bank of the Mississippi

River and is subject to frequent backwater encroachment from the river. The lake is approximately 0.75 mile in length, 400 feet wide, and 20 feet deep at its deepest parts. Devil's Swamp Lake also receives discharges and stormwater runoff from a hazardous waste facility northeast of the lake and from some industrial facilities, and it receives floodwater from the Mississippi River during high flow periods. During flood conditions, the western and northern boundaries of the lake are indistinct because it coalesces with water of the surrounding swamp. Bayou Baton Rouge drains through Devil's Swamp and flows south into the Mississippi River upstream from the Baton Rouge Harbor Canal (see USGS report at http://pubs.usgs.gov/sir/2006/5301/pdf/sir2006-5301.pdf).

***Impairment and pollutant causing impairment***

Devil's Swamp Lake is listed in Louisiana's 2018 Water Quality IR as not fully supporting the fish and wildlife propagation due to the presence of unacceptable levels of PCBs and mercury in crawfish and finfish. The designated use of primary contact recreation remains impaired due to the possible presence of arsenic, hexachlorobenzene (HCB), hexachlorobutadiene (HCBD), lead, and mercury in sediments.

***Sources of pollutant causing impairment***

Industrial facilities have discharged to the swamp surrounding Devil's Swamp Lake since the 1960s. Since 1980, repeated sampling of water, sediment, and fish tissue has demonstrated the presence of organic compounds, including PCBs, in Devil's Swamp Lake. Testing in March 1986 confirmed the presence of PCBs in lake sediments and the effluent channel used by Rollins Environmental Services (RES), now known as Clean Harbors Environmental Services. Following these analyses, both LDEQ and LDH tested for toxic substance residues in edible tissues of fish samples collected from the lake. The tissue analyses revealed PCB concentrations below the Food and Drug Administration (FDA) action level. However, concentrations of HCB and HCBD were found at levels above action levels protecting against long-term chronic exposure (see http://www.atsdr.cdc.gov/hac/pha/pha.asp?docid=729&pg=2#table10, Table 10).

In addition, high levels of lead, mercury, and arsenic were present. Following review of the analytical results, the state epidemiologist recommended issuance of an advisory against swimming in and consumption of fish from Devil's Swamp Lake. LDWF, LDH, and LDEQ issued a joint advisory in October 1987. The agencies issued a revised health advisory that included the remainder of Devil's Swamp and Bayou Baton Rouge in June 1993. On August 12, 2015 the three agencies issued the most recent revision to the Devil's Swamp advisory. The revised advisory recommends no swimming or other primary contact water sports and no consumption of fish or crawfish from the area. The boundaries of this advisory may be adjusted in the future to reflect results of new information.

The area of concern is bounded on the north by the former Hall-Buck Marine Road, on the east by the bluffs and the Baton Rouge Barge Harbor, and on the south and west by the Mississippi River. (see http://deq.louisiana.gov/assets/docs/Water/Mercury-FishConsumptionAdvisoryTable.pdf and also http://new.dhh.louisiana.gov/assets/oph/Center-EH/envepi/fishadvisory/Documents/ChemAdvisories2016.pdf).

## 2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

***Water quality target***

For arsenic, LAC 33:IX:1113.C.Table 1A specifies a criterion of 10.0 µg/L for both human health protection and drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. There is no human health protection, non-drinking water criterion for arsenic. The human health protection and drinking water supply criterion for arsenic is more stringent (more protective) than the applicable freshwater acute and chronic aquatic life protection criteria.

For HCB, LAC 33:IX:1113.C Table 1 specifies a criterion of $2.5 \times 10^{-4}$ µg/L for non-drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. There are no freshwater acute and chronic aquatic life protection criteria for HCB.

For HCBD, LAC 33:IX:1113.C Table 1 specifies a criterion of 0.11 µg/L for non-drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. The non-drinking water supply criterion for HCBD is more stringent (more protective) than the applicable freshwater acute and chronic aquatic life protection criteria.

For lead, LAC 33:IX:1113.C Table 1A specifies a criterion of 50.0 µg/L for both human health protection and drinking water supply, which is protective of primary and secondary contact recreation and fish consumption. There is no human health protection, non-drinking water criterion for lead. The aquatic life freshwater acute and chronic criteria are hardness dependent. Based on the lowest acceptable hardness value of 25 mg/L used in calculating lead criteria values, the lowest possible chronic lead criterion for aquatic life protection is 0.54 µg/L.

For methylmercury in fish tissue, a final screening level of 230.0 µg/kg is suggested in *Tissue Screening Level Guidelines for Issuance of Public Health Advisories for Selected Contaminants* (March 2012. see http://deq.louisiana.gov/assets/docs/Water/Fish_Swim_Advisories/TSL_Documentation_March_2012.pdf).

For total PCBs, LAC 33:IX:1113.C Table 1 specifies a criterion of $5.61 \times 10^{-5}$ µg/L for non-drinking water supply and to protect for primary and secondary contact recreation and fish consumption. The human health protection and non-drinking water supply criterion for PCBs is more stringent (more protective) than the applicable freshwater acute and chronic aquatic life protection criteria.

***Controls that will achieve Water Quality Standards***

The land use and hydrology of the watershed is complex and is divided into five areas for investigational purposes:

- North and west of Petro-Processors (Petro-Processors is an NPL site located in the Devil's Lake watershed): This area has not been extensively studied; however, no contaminants associated with industrial activities have been detected at concentrations in excess of background levels in samples from this area. Based on hydrology and drainage patterns, it is unlikely that wastes from industrial activities affect the area.
- Immediately south to about 3,000 feet south of the former Hall-Buck Marine Road: Wastes released from pits during operation of the Petro-Processors NPL site extensively impacted the northeast corner of this area. This area has been extensively investigated and is being remediated under a 1984 Consent Decree. Four remedial

processes have been applied. The most contaminated channel was excavated to the maximum depth that could safely be achieved. A second channel has been diverted and the original course filled with clean soil. The remaining less-contaminated sediments are being allowed to continue to naturally attenuate. The sediments are naturally anoxic enough that the chlorinated contaminants are being dechlorinated. The groundwater is also undergoing remediation by natural attenuation. This area also has an oxygen-reducing environment that allows natural dechlorination of the contaminants.

- Area bounded by the southern boundary of the area described in the preceding bullet and the northern end of Devil's Swamp Lake: There are scattered detections of chlorinated organics at concentrations that are well below levels that pose threats to the environment or human health.
- Devil's Swamp Lake: The lake and the swamp immediately adjacent have been shown to be contaminated by some of the chlorinated compounds present in the area described in the second bullet, above, and by PCBs. The probable source of these contaminants is the former RES site. USEPA is in the process of listing this site on the NPL. The state of Louisiana has agreed with this action.
- South Swamp: This is the area to the south and west of Devil's Swamp Lake that has not been impacted by either the RES site or the Petro-Processors site.

***Descriptions of requirements under which pollution controls will be implemented***

The Devil's Swamp Lake site was proposed for addition to the NPL in the Federal Register on March 8, 2004. USEPA completed evaluation and negotiations with some Potentially Responsible Parties (PRPs) and issued a Unilateral Administrative Order to PRPs to conduct a Remedial Investigation/Feasibility Study on December 3, 2009. As of December 2015 PRPs completed a Final Tier 2 Remedial Investigation Report that was made available to the public at the Scotlandville Branch of the East Baton Rouge Parish Library. For a history of site enforcement and cleanup actions, see USEPA ID LAD981155872, Devil's Swamp Lake at: http://www.epa.gov/region6/6sf/pdffiles/devils-swamp-la.pdf.

**3) Estimate or Projection of the Time When Water Quality Standards Will Be Met**

Devil's Swamp Lake is currently under USEPA lead for the NPL. USEPA and LDEQ are working with the responsible parties to investigate the site; it is in the early stages of investigation (Remedial Investigation/Feasibility Study). Initial data has recently been collected and future data will be collected as the investigation proceeds. A fish consumption and swimming advisory remain in place for the area.

Based on AWQMN information and the arsenic criterion described above, LDEQ removed the arsenic impairment from Devil's Swamp Lake/Bayou Baton Rouge with the 2012 IR. Devil's Swamp Lake will continue to be reported as impaired for other WICs until the conclusion of all remediation actions and determination of full support.

Based on the well-established nature of the contamination issues and the ongoing NPL actions, IRC 4b remains the most suitable classification for this water body. Sampling data will be used to determine when the water body is fully supporting fish and wildlife propagation and primary contact recreation uses.

**4) Schedule for Implementing Pollution Controls**

This site is in the early stages of investigation. The Tier 1 Remedial Investigation Report containing the most recent collection of sample data and summaries for the site is available on LDEQ's EDMS under AI#86800, 2/10/12 (Electronic Document Management System http://edms.deq.louisiana.gov/app/doc/querydef.aspx). A Tier 2 Remedial investigation was conducted to collect additional data to support findings in the Tier 1 report. This report is also available on LDEQ's EDMS under AI#86800, 10/31/2015 (see http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=9998159&ob=yes&child=yes).

**5) Monitoring Plan to Track Effectiveness of Pollution Controls**

Monthly progress reports are submitted by Clean Harbors Environmental Services (formerly Rollins Environmental Services) in accordance with the Administrative Order issued by LDEQ in 2003. See http://edms.deq.louisiana.gov/app/doc/view.aspx?doc=10890140&ob=yes&child=yes for the latest monthly progress report of November, 2017. LDEQ will continue to monitor Devil's Swamp Lake and Bayou Baton Rouge as part of the routine AWQMN.

**6) Commitment to Revise Pollution Controls, As Necessary**

LDEQ is committed to continuing ambient water quality monitoring as part of the routine monitoring rotations. LDEQ is also committed to working with responsible parties in determining appropriate remedial actions.

## Statewide Louisiana Subsegments Impacted by Non-Native Aquatic Plants

(Multiple subsegments and uses, see Table 3.2.10 for details.)

**1) Identification of Subsegment and Statement of Problem Causing Impairment**

***Subsegment Description***

Subsegments classified as IRC 4b with impairment caused by non-native aquatic plants are located throughout the state of Louisiana. The subsegments encompass rivers, lakes, bayous, tidal channels, and canals and occur in nine of Louisiana's twelve major river basins. Serving as a corridor between the continental United States and the subtropical world beyond the Gulf of Mexico, Louisiana has a humid, subtropical climate with abundant rainfall enabling rapid growth of vegetation. Average annual precipitation varies from 48 inches in the northwestern part of the state near Shreveport to 64 inches in the southeastern coastal plains near Thibodaux. With over one million acres of freshwater lakes/reservoirs, over seven million acres of wetlands, and nearly 8,000 square miles of estuaries and bays at risk, a substantial portion of Louisiana is threatened by invasive aquatic plants (Table 3.2.13).

**Table 3.2.13.**

**Subsegments not supporting the designated use of fish and wildlife propagation and classified as Integrated Report Category 4b for suspected cause of non-native aquatic plants.**

| Subsegment Number | Subsegment Description | Water Body Type | Size[1, 2] |
|---|---|---|---|
| LA010701_00 | Bayou Teche-From Berwick to Wax Lake Outlet | River | 13.9 |

**Table 3.2.13.**

**Subsegments not supporting the designated use of fish and wildlife propagation and classified as Integrated Report Category 4b for suspected cause of non-native aquatic plants.**

| Subsegment Number | Subsegment Description | Water Body Type | Size[1, 2] |
|---|---|---|---|
| LA020101_00 | Bayou Verret, Bayou Chevreuil, Bayou Citamon, and Grand Bayou | River | 40.1 |
| LA020102_00 | Bayou Boeuf, Halpin Canal, and Theriot Canal | River | 23.4 |
| LA020103_00 | Lake Boeuf | Lake | 153.6 |
| LA020201_00 | Bayou Des Allemands-From Lac Des Allemands to old US-90 (Scenic) | River | 7 |
| LA020202_00 | Lac Des Allemands | Lake | 16,362.6 |
| LA020301_00 | Bayou Des Allemands-From US-90 to Lake Salvador (Scenic) | River | 13.7 |
| LA020302_00 | Bayou Gauche | River | 3.2 |
| LA020304_00 | Lake Salvador | Lake | 49,476.5 |
| LA020401_00 | Bayou Lafourche-From Donaldsonville to ICWW at Larose | River | 67.4 |
| LA040401_00 | Blind River-From Amite River Diversion Canal to mouth at Lake Maurepas (Scenic) | River | 5.1 |
| LA040403_00 | Blind River-From headwaters to Amite River Diversion Canal (Scenic) | River | 20.3 |
| LA040404_00 | New River-From headwaters to New River Canal | River | 23.2 |
| LA040602_00 | Lake Maurepas | Estuary | 90.5 |
| LA060102_00 | Cocodrie Lake | Lake | 6,099 |
| LA060203_00 | Chicot Lake | Lake | 1,157.2 |
| LA070202_00 | Raccourci Old River | Lake | 4,160 |
| LA080102_00 | Bayou Chauvin-From headwaters to Ouachita River | River | 6.6 |
| LA100302_00 | Black Bayou Lake-From LA-1 to spillway | Lake | 4,382.4 |
| LA100406_00 | Flat River-From headwaters to Loggy Bayou | River | 55 |
| LA100502_00 | Lake Bistineau | Lake | 17,216 |
| LA100603_00 | Wallace Lake | Lake | 9,248 |
| LA100605_00 | Clear Lake and Smithport Lake; includes old Edwards Lake | Lake | 2,944 |
| LA100702_00 | Black Lake Bayou-From one mile north of Leatherman Creek to Black Lake (Scenic) | River | 37 |
| LA101302_00 | Iatt Lake | Lake | 6,280.3 |
| LA110101_00 | Toledo Bend Reservoir-From Texas-Louisiana state line to Toledo Bend Dam | Lake | 165,486.5 |
| LA120108_00 | False River | Lake | 3,133.1 |
| LA120110_00 | Bayou Cholpe-From headwaters to Bayou Choctaw | River | 8.2 |

**Table 3.2.13.**

**Subsegments not supporting the designated use of fish and wildlife propagation and classified as Integrated Report Category 4b for suspected cause of non-native aquatic plants.**

| Subsegment Number | Subsegment Description | Water Body Type | Size[1, 2] |
|---|---|---|---|
| LA120204_00 | Lake Verret and Grassy Lake | Lake | 16,311.2 |
| LA120301_00 | Bayou Terrebonne-From Thibodaux to ICWW in Houma | River | 14.9 |
| LA120404_00 | Lake Penchant | Lake | 882.5 |
| LA120405_00 | Lake Hache and Lake Theriot | Lake | 1,685.4 |
| LA120501_00 | Bayou Grand Caillou-From Houma to Bayou Pelton | River | 8.3 |
| LA120503_00 | Bayou Petit Caillou-From Bayou Terrebonne to LA-24 bridge | River | 5.2 |
| LA120504_00 | Bayou Petit Caillou-From LA-24 bridge to Boudreaux Canal (Estuarine) | River | 11.2 |
| LA120505_00 | Bayou Du Large-From Houma to Marmande Canal | River | 6.7 |
| LA120506_00 | Bayou Du Large-From Marmande Canal to 1/2 mile north of St. Andrews Mission (Estuarine) | River | 9.6 |
| LA120507_00 | Bayou Chauvin-From Ashland Canal to Lake Boudreaux (Estuarine) | River | 12.7 |
| LA120601_00 | Bayou Terrebonne-From Houma to Company Canal (Estuarine) | River | 7.4 |
| LA120602_00 | Bayou Terrebonne-From Company Canal to Humble Canal (Estuarine) | River | 9.5 |
| LA120604_00 | Bayou Blue-From ICWW to Grand Bayou Canal | River | 12.8 |
| LA120605_00 | Bayou Pointe Au Chien-From headwaters to St. Louis Canal | River | 7.8 |
| LA120606_00 | Bayou Blue-From Grand Bayou Canal to Bully Camp Canal (Estuarine) | River | 5.9 |
| LA120703_00 | Bayou Du Large-From 1/2 mile north of St. Andrews Mission to Caillou Bay (Estuarine) | River | 21.5 |

1. Size Units: River = miles; Lake = acres; Estuary = square miles
2. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

***Impairment and pollutant causing impairment***

Subsegments shown in Table 3.2.13 are listed in Louisiana's 2018 IR as not fully supporting the FWP designated use as a result of *non-native aquatic plants*. Non-native aquatic plants are included in the NPDES list of pollutants as "biological materials" (see https://www.epa.gov/sites/production/files/2015-09/documents/pwm_app-a.pdf). Invasive aquatic species are rapid colonizers and are competitively superior to most native plants,

quickly dominating the aquatic plant community after introduction to a water body. Specific species of non-native aquatic plants were not reported by LDEQ staff making these impairment determinations. However, typical non-native aquatic plants of concern for the reported subsegments may include but are not limited to water hyacinth (*Eichhornia crassipes*), hydrilla (*Hydrilla verticillata*), giant salvinia (*Salvinia molesta*), and common salvinia (*Salvinia minima*). Many of the following species may also be of concern in the subsegments reported as impaired. All species mentioned below will not be present in all subsegments. According to the *State Management Plan for Aquatic Invasive Species in Louisiana* (Tulane Univ. and Xavier Univ. 2005), the following aquatic plants are classified as "extensively established species" that occur in eight or more drainage basins in Louisiana:

- Water hyacinth – South American native; clogs waterways, impedes boat traffic, slows water currents and blocks light to submerged vegetation, thus lowering DO levels
- Parrot feather (*Myriophyllum aquaticum*) – South American native that can block waterways, preventing fishing and boat traffic and providing ideal mosquito breeding habitat
- Hydrilla – rooted aquatic weed from Asia forms thick mats which can impede boat traffic and swimming, and lower DO levels, killing fish
- Wild taro (*Colocasia esculenta*) – forms dense stands in riparian zones and displaces native vegetation
- Brazilian waterweed (*Egeria densa*) – forms thick mats at the water surface, impeding swimming, boating, and fishing; chokes out native vegetation and degrades water quality and fish habitat
- Eurasian watermilfoil (*Myriophyllum spicatum*) – forms thick mats at the water surface, impeding swimming, boating, and fishing; outcompetes native vegetation and degrades water quality for fish and birds
- Water lettuce (*Pistia stratiotes*) – believed to be native to Africa; impedes swimming, boating, and fishing; degrades water quality for native vegetation and adversely affects fish and bird populations
- Common salvinia – Central and South American native; forms thick mats on the water surface, in some instances up to almost 10 inches deep; shades and outcompetes native plants, diminishing habitat for fish and birds

The following aquatic plants are classified as "locally established species" that occur in three to seven Louisiana drainage basins:

- Giant salvinia – free-floating, rootless plant forms thick mats on the water surface, in some instances up to almost 10 inches deep; shades and outcompetes native plants, diminishing habitat for fish and birds; can double its biomass every seven to 10 days under ideal conditions; chokes waterways and has interfered with floodgate operation
- Cogon grass (*Imperata cylindrica*) (the Louisiana Aquatic Invasive Species (LAIS) taskforce classifies cogon grass as an aquatic invasive because it was introduced through an aquatic pathway and occurs in areas that experience some flooding; it spreads rapidly with a dense growth pattern that creates unsuitable habitat for native plants, insects, mammals, and birds.)

The following aquatic plants occur in fewer than three drainage basins in Louisiana and are classified as "potential arrivals":

- Purple loosestrife (*Lythrum salicaria*) – European native with prolific seed production; disrupts ecosystems by outcompeting native plants, diminishing habitat for fish and birds; clogs irrigation systems and destroys grazing pastures
- "Cylindro" (*Cylindrospermopsis raciborskii*) – an invasive, subtropical, microscopic species of blue-green algae; believed to have been introduced to Florida over 30 years ago and has spread rapidly across North America; highest concentrations below the water surface; produces neurotoxins and hepatotoxins; has caused deaths of humans and wildlife worldwide; outcompetes other algae and can cause public health impacts by its presence in drinking water reservoirs

The *State Management Plan for Aquatic Invasive Species in Louisiana* places Louisiana second only to Florida in number of introduced aquatic plant species, with 32 and 45, respectively.

***Sources of pollutant causing impairment***

The suspected source of impairment for these IRC 4b subsegments is *introduction of non-native organisms (accidental or intentional)*. Numerous sources state that the history of invasive aquatic plants in Louisiana started with the distribution of water hyacinth at the 1884 World's Industrial and Cotton Centennial Exposition in New Orleans (available at: http://www.lsuagcenter.com/en/communications/publications/agmag/Archive/2010/fall/Invasive-Aquatic-Weeds-in-Louisiana.htm). In this century, Louisiana is home to the busiest port system in the nation in terms of tonnage, offering ready access for invasive aquatic plants to enter state waters from bulk and containerized cargoes and through ballast discharge of ships. Other invasive plants were introduced to Louisiana through the aquarium trade, as a result of nursery sales, and, in the cases of Eurasian water milfoil and Brazilian water weed, possibly by federal authorities with beneficial intent. Many species are also transferred among water bodies on boats and boat trailers. Natural sources are also responsible for the spread of invasive aquatic plants, including wind, flooding, and animals, including birds.

## 2) Description of Pollution Controls and How They Will Achieve Water Quality Standards

***Water quality target***

As stated in LAC 33:IX.1113.B.1, "The waters of the state shall be maintained in an aesthetically attractive condition and shall meet the generally accepted aesthetic qualifications." (see http://deq.louisiana.gov/resources/category/regulations-lac-title-33). As set forth in LAC 33:IX.1113.B.12, "The biological and community structure and function in state waters shall be maintained, protected, and restored except where not attainable and feasible as defined in LAC 33:IX.1109. This is the ideal condition of the aquatic community inhabiting the unimpaired water bodies of a specified habitat and region as measured by community structure and function...Reference site conditions will represent naturally attainable conditions…This condition shall be determined by consistent sampling and reliable measures of selected, indicative communities of animals…and/or plants as established by the department…" The water quality target can be seen as the preservation and restoration of integrity to the native, balanced biological and aquatic community structure in Louisiana's aquatic ecosystems.

USEPA's NPDES vessels program regulates incidental discharges from the normal operation of vessels. The NPDES vessels program does not regulate discharges from military vessels or recreational vessels. Instead, those are regulated by other USEPA programs under §312 of the Clean Water Act. Incidental discharges from the normal operation of vessels include, but are

not limited to, ballast water, bilgewater, graywater (e.g., water from sinks, showers), and anti-foulant paints (and their leachate). These discharges may result in negative environmental impacts via the addition of traditional pollutants or, in some cases, by contributing to the spread of Aquatic Invasive Species (see https://www.epa.gov/sites/production/files/2015-09/documents/ballast14h.pdf).

USEPA currently regulates vessel discharges with the Vessel General Permit (VGP). The current permit, the 2013 VGP is in effect until 2018. USEPA is proposing a draft 2013 VGP and Small Vessel General Permit (sVGP) to authorize discharges incidental to the normal discharge of operations of commercial vessels. This site is intended to answer many questions the commercial vessel owner/operator may have concerning the draft VGP and/or the sVGP. (see https://www.epa.gov/sites/production/files/2013-12/documents/vesselgeneralpermit-erp.pdf).

Management actions described by the LAIS Task Force (see below), should, when implemented, decrease the rate of introduction of invasive aquatic plant species into Louisiana water bodies. It is doubtful that full eradication of invasive aquatic plants will be achieved in light of the numerous natural mechanisms of spread, such as wind, flooding, and birds that cannot be legislated or controlled.

***Controls that will achieve Water Quality Standards***

The LAIS Task Force convened by order of Governor M. J. Foster determined that "invasive species pose a serious threat to the economic and ecological health of the State of Louisiana" and produced the *State Management Plan for Aquatic Invasive Species in Louisiana-July 2005* (see http://is.cbr.tulane.edu/docs_IS/Louisiana-AIS-Mgt-Plan.pdf). The plan describes the nature and extent of this environmental problem and proposes a coordinated suite of specific management actions to minimize negative impacts.

LAIS Task Force goal and objectives are as follows:

Goal: Prevent and control the introduction of new nonindigenous species into Louisiana, control the spread and impact of existing invasive species, and eradicate locally established invasive species wherever possible.

> Objective 1: Coordinate all aquatic invasive species management activities or programs within Louisiana and collaborate with regional, national, and international aquatic invasive species programs
>
> Objective 2: Prevent and control the introduction/reintroduction of nonindigenous invasive species through education about species and pathways, targeting the general public (including schools), industries, user groups, government agencies, and nongovernmental organizations
>
> Objective 3: Eliminate locally established invasive species through monitoring, early detection, rapid response, and early eradication
>
> Objective 4: Control the spread of established invasive species through cooperative management activities designed to minimize impacts when eradication is impossible
>
> Objective 5: Prevent the introduction of non-native species, or the spread of existing ones, through legislation and regulation

The LAIS Task Force recommended these management actions:

- Hire staff to administer the LAIS Council and Advisory Task Force
- Develop a rapid Response and Early Eradication Plan
- Assess Louisiana ports and waterways for invasive species

***Descriptions of requirements under which pollution controls will be implemented***

Congress has been concerned about economic and ecological risks from non-native plants since at least 1912, when it passed the Plant Quarantine Act. More recently, Congress passed the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA–see http://www.anstaskforce.gov/Documents/nanpca90.pdf). NANPCA was amended and expanded by the National Invasive Species Act of 1996 (see https://www.govtrack.us/congress/bills/104/hr4283) in order to prevent the spread of invasive species and to fund, manage, and disseminate information that will help control the impacts of invasive species. The National Invasive Species Council was established by Executive Order 13112 to ensure that federal programs and activities to prevent and control invasive species are coordinated, effective, and efficient (see http://www.invasivespecies.gov/).

Taking the mandates of the CWA into consideration, Congress passed the Clean Boating Act of 2008 (available at https://www.epa.gov/vessels-marinas-and-ports/about-clean-boating-act-cba) directing USEPA to develop and promulgate management practices for recreational vessels to mitigate adverse effects from recreational boat discharges such as bilge water, graywater, and deck runoff that may spread invasive species.

The federal government has attempted to control introduction of invasive plant and animal species by requiring commercial shipping interests to submit a ballast water management plan. In March 2012, the Department of Homeland Security/U.S. Coast Guard published the Ballast Water Discharge Standard Rule, adding performance standards for discharges of ballast water (see http://www.greatlakes-seaway.com/en/pdf/Everett_030314.pdf).

In Louisiana, LDWF has jurisdiction over listed noxious aquatic plants. La. R.S. 56:328(B) prohibits anyone at any time from knowingly importing or causing the import of listed aquatic plant species or causing them to be transported into Louisiana from any other state or country without first obtaining a written permit from the Wildlife and Fisheries Commission (see http://legis.la.gov/Legis/Law.aspx?d=105222).

The LAIS Task Force was formed by authority of Louisiana Executive Order MJF 02-11 on June 4, 2002. In 2004 a bill passed both the Louisiana House and Senate and was signed into law by Governor Kathleen Blanco calling for the creation of the LAIS Council and Advisory Task Force to implement the LAIS management plan (RS 56:360.1 http://legis.la.gov/Legis/Law.aspx?d=285476; RS 56:360.2 http://legis.la.gov/Legis/Law.aspx?d=285477).

As noted above, the LDWF currently leads Louisiana's aquatic invasive species efforts. Its work includes spraying of water bodies overtaken by invasive species and periodic drawdowns of reservoirs to try and limit the spread. In addition, the agency has a public education component. See http://www.wlf.louisiana.gov/fishing/aquatic-vegetation-control-plans for more information on LDWF invasive species programs.

**3) Estimate or Projection of the Time When Water Quality Standards Will Be Met**

IRC 4b remains the most suitable classification for the listed subsegments because of the known nature of the impairment in question and the ongoing activities described above. Because invasive aquatic plants are spread by numerous pathways to and among water bodies and because legislation is pending to address some of these pathways, it is not yet possible to estimate when non-native aquatic plants will no longer be a concern.

**4) Schedule for Implementing Pollution Controls**

Non-native aquatic plant control activities are based on the LAIS Task Force management plan. Due to the nature of the impairment in question it is not possible to develop a reasonable schedule for implementation of pollution control activities.

**5) Monitoring Plan to Track Effectiveness of Pollution Controls**

The LAIS Task Force, currently staffed only by LDWF personnel, is required to submit an annual status report on its aquatic invasive species management plan and its implementation every year to the state legislature. LDEQ will continue routine surface water quality monitoring of the listed subsegments as part of the AWQMN.

**6) Commitment to Revise Pollution Controls, As Necessary**

LDEQ is committed to continuing ambient water quality monitoring as part of the routine monitoring rotations, including evaluation of non-native aquatic plant observations. Revisions to controls for non-native aquatic plants through the LDWF management plan and its implementation are required every year to the state legislature.

## Wetland Assimilation Areas for South Slough (LA040604_001), Chinchuba Swamp Wetland (LA040805_00), and Thibodaux Wetland (LA040806_00)

**2) Identification of Subsegment and Statement of Problem Causing Impairment**

***Subsegment Description***

South Slough Wetland (LA040604_001), Chinchuba Swamp Wetland (LA040805_00), and Thibodaux Wetland (LA040806_00) are all wetland assimilation area subsegments identified in LAC 33:IX.1123. Table 3. They are used by the Cities of Hammond, Mandeville, and Thibodaux, respectively, as part of their wastewater treatment facilities.

***Impairment and pollutant causing impairment***

All three subsegments are reported in Louisiana's 2018 Water Quality IR as not fully supporting the fish and wildlife propagation use, due to assessment of primary productivity in the assimilation areas as compared to reference sites. Change in vegetative primary productivity in the assimilation areas was found to be more than 20 percentage points below the corresponding productivity in the reference areas. At this time, the cause of the reduced vegetative productivity is unknown. In accordance with new permit conditions established for wetland assimilation sites, the Cities of Thibodeaux and Mandeville are required to develop and implement an adaptive management plan. The Water Permits Division will also continue to analyze *all* permit data, utilizing alternative statistical methods to establish upward or downward long-term trends, to assist the permittees with identifying specific management strategies. An independent contractor has been hired to evaluate the City of Hammond's wetland assimilation site.

***Sources of pollutant causing impairment***

There are no explicit sources of pollutant causing the reduced vegetative productivity in the wetland assimilation areas, although permanent flooding of the wetland area(s) may be a contributing factor.

**2) Description of Pollution Controls and How They Will Achieve Water Quality Standards**

***Water quality target***

The water quality target for each subsegment will be met when the percent change in vegetative productivity from year-to-year in the assimilation areas achieves positive growth or is no more than 20 percentage points below the reference area productivity percent change.

***Controls that will achieve Water Quality Standards***

Proposed revisions to Volume 3 of the Water Quality Management Plan, Permitting Guidance Document for Implementing Louisiana Surface Water Quality Standards, have been submitted to EPA Region 6 and are currently under review. The revisions include more specific permit language and requirements, which will ensure achievement of water quality standards. The specific requirements have already been included in the permits for the Cities of Thibodeaux and Mandeville and will be included in all other wetland assimilation permits upon reissuance.

***Descriptions of requirements under which pollution controls will be implemented***

Per the proposed revisions to Volume 3 of the Water Quality Management Plan, the permittee must develop and implement an Adaptive Management Plan. This plan shall include, but is not limited to the following:

a. *Historical and current conditions of the wetland assimilation areas* – The Adaptive Management Plan shall include the historical and current conditions of the wetland assimilation areas. This may include a record of plant species, current state of degradation, probable cause of the degradation, etc. The Plan shall include an overview on how the wetlands assimilation project and the specific adaptive management practices are benefiting the overall health to the wetland areas.

b. *Discharge distribution plan* – This shall be an established procedure describing how the effluent will be distributed into the wetland assimilation area, promoting restoration and sustainability of the wetland ecosystem while, at the same time, assimilating nutrients. Healthy wetlands typically experience a natural pulsing, or fluctuation, of floodwaters. Therefore, the discharge distribution plan must establish a method to discharge effluent into the wetlands in a manner that ensures uniform coverage and to the maximum extent possible simulates natural healthy conditions, within the wetland assimilation area.

c. *Use of water control structures* – The use of water control structures shall be used in areas to avoid short-circuiting to maximize the assimilation potential of the wetland.

d. *Extension or modification of water distribution system* – The extension of the water distribution system may be necessary to ensure uniform coverage across the assimilation area.

e. *Control of invasive species, including plant and animal* – The introduction of nutrient enriched effluent may invite many invasive species into the wetland assimilation area, which may cause a negative impact to the area. Therefore, a program designed to control these invasive species shall be developed.

f. *Plantings of trees and other vegetation* – In some cases, the wetland assimilation areas are heavily degraded and are permanently flooded. In these areas, the planting of seedlings may be advantageous to ensure new growth, thus enhancing the longevity and sustainability of the wetland assimilation area.

g. *Dye studies* – As treated wastewater is discharged into the wetland assimilation area, changes within the area are expected. A negative impact could be channelization of the effluent, reducing the assimilation potential of the area. Therefore, in the fourth year of the permit cycle, dye studies shall be conducted to ensure that uniform coverage over the wetland assimilation area is being maintained.

**3) Estimate or Projection of the Time When Water Quality Standards Will Be Met**

The Louisiana Administrative Code calls for the assessment of biological integrity for wetlands approved for wastewater assimilation projects, with assessments occurring over a five-year period of record. The 2018 IR represents the first assessment of these areas in Louisiana. The respective sewage treatment facilities were notified of the 2018 IR impairments and put on notice that they must investigate the cause of the vegetative productivity impairment, and then develop a corrective action plan. Due to the unknown cause of the impairment and due to the long-term nature of monitoring and assessment, it is not possible to estimate a time when water quality standards will be met. Additionally, Water Permits Division staff will continue to analyze the Annual Reports for each permittee to ensure compliance with the permit(s).

**4) Schedule for Implementing Pollution Controls**

The respective sewage treatment facilities were notified of the 2018 IR impairments and put on notice that they must investigate the cause of the vegetative productivity impairment, and then develop a corrective action plan.

**5) Monitoring Plan to Track Effectiveness of Pollution Controls**

The sewage treatment facilities are required to conduct vegetative sampling every year under terms of their NPDES permits. Results of this sampling will be reviewed and reevaluated as part of the 2020 IR.

**6) Commitment to Revise Pollution Controls, As Necessary**

Having been put on notice by the Water Permits Division, the respective sewage treatment facilities are required to continue their investigations and corrective activities until vegetative productivity in the wetland assimilation areas has improved to the point of meeting the assessment requirements of LAC 33:IX.1113.12.b.

## USEPA's National Wetlands Conditions Assessment

Beginning in the early 2000s, USEPA began development of what came to be known as the National Aquatic Resource Surveys (NARS). NARS was designed to answer national-scale questions regarding water quality; questions which could not be easily answered by aggregating the individual state's water quality reports required under CWA sections 305(b) and 303(d). Each year one of four primary water body types is evaluated under the NARS program. Water body

types include rivers and streams, lakes and reservoirs, wetlands, and coastal waters. Annual reports for each water body type are broken down into large regions in order to standardize water quality benchmarks and reporting as much as possible within the regions. This allows NARS to provide a statistically-valid snapshot or "report card" of water quality across large regions and water body types within the United States.

The NARS program differs from most state water quality sampling in that NARS sites are randomly selected each year based on a statistically designed randomization process. Random selection is a key component of the statistically-valid sampling required by the NARS program. By contrast, LDEQ's water quality monitoring program is designed to target nearly all of the water body subsegments identified in Louisiana's water quality regulations (LAC 33:IX.1123.Table 3). In addition, LDEQ's monitoring sites are frequently located at bridge crossings or piers to facilitate the quick and efficient sample runs required to meet certain parameter holding times for laboratory analysis. This targeted approach, with occasional modifications to site locations over the years, has been in place in Louisiana since 1958. It allows LDEQ to assess all of the major water bodies in the state and many of the smaller, more remote ones as well. The approach also allows LDEQ to develop long-term trends analysis on many of the state's water bodies due to consistent sampling over many years. Both the NARS and LDEQ approaches have their merits and weaknesses, which should be taken into account when evaluating the results. More information on NARS, including sampling methods and statistical data analysis, can be found on the EPA website at, https://www.epa.gov/national-aquatic-resource-surveys.

In May 2016 USEPA released its final report for the 2011 National Wetland Conditions Assessment (NWCA) (USEPA 2016). Sampling for the NWCA took place in the spring and summer of 2011. A total of 1,179 mostly randomly selected wetland sites across the country were sampled using standardized methods. Sites were tested for impacts to vegetation, soils, hydrology, algae, water chemistry, and potential wetland stressors. Results of the NWCA were aggregated by USEPA's Office of Wetlands, Oceans and Watersheds and by its Office of Research and Development at national and regional levels. Aggragting in this manner was done to provide a statistically valid snapshot of wetland conditions across the nation and within the established wetland regions. Louisiana falls within the coastal plains wetland region. A total of 69 sites were sampled in Louisiana. The resulting Louisiana specific data was aggragated for LDEQ by personnel with USEPA, Region 6 using R-Scripts. This state specific aggregation was done in a manner similar to that used for national and regional level assessments.

Due to the randomized and single sampling event nature of the NWCA, it is important to note that while site-specific data is available, the data should only be considered as an aggregated snapshot of wetland conditions in the state, regions, or nation as a whole. Figures 3.2.8-3.2.10 provide snapshots of wetland conditions in the coastal plain region, and were obtained from the NWCA report (USEPA 2016). Figures 3.2.11-3.2.21 provide a similar snapshot of wetland conditions in Louisiana, as determined by NWCA/NARS protocols.

The NWCA indicators used by USEPA have not been sampled or evaluated by LDEQ; therefore, it is not possible to determine if the benchmarks are fully suitable for Louisiana's wetlands. The state-specific snapshot provided by the NWCA data should not be considered as definitive or indicative of water quality assessments for Integrated Report purposes.

For more information concerning USEPA's National Wetland Condition Assessment 2011 please go to, https://www.epa.gov/national-aquatic-resource-surveys/nwca. For information regarding

USEPA's National Aquatic Resource Surveys, which include The National Lakes Assessment; The National Rivers and Streams Assessment; and the National Coastal Conditions Assessment; please go to, http://www.epa.gov/national-aquatic-resource-surveys.

**Figure 3.2.8.**

National Wetland Condition Assessment 2011 survey results for the wetlands (i.e., all target wetland types) across the Coastal Plain. (Bars show the percentage of wetland area within a condition or stressor class. Error bars represent 95% confidence intervals.) (USEPA 2016)

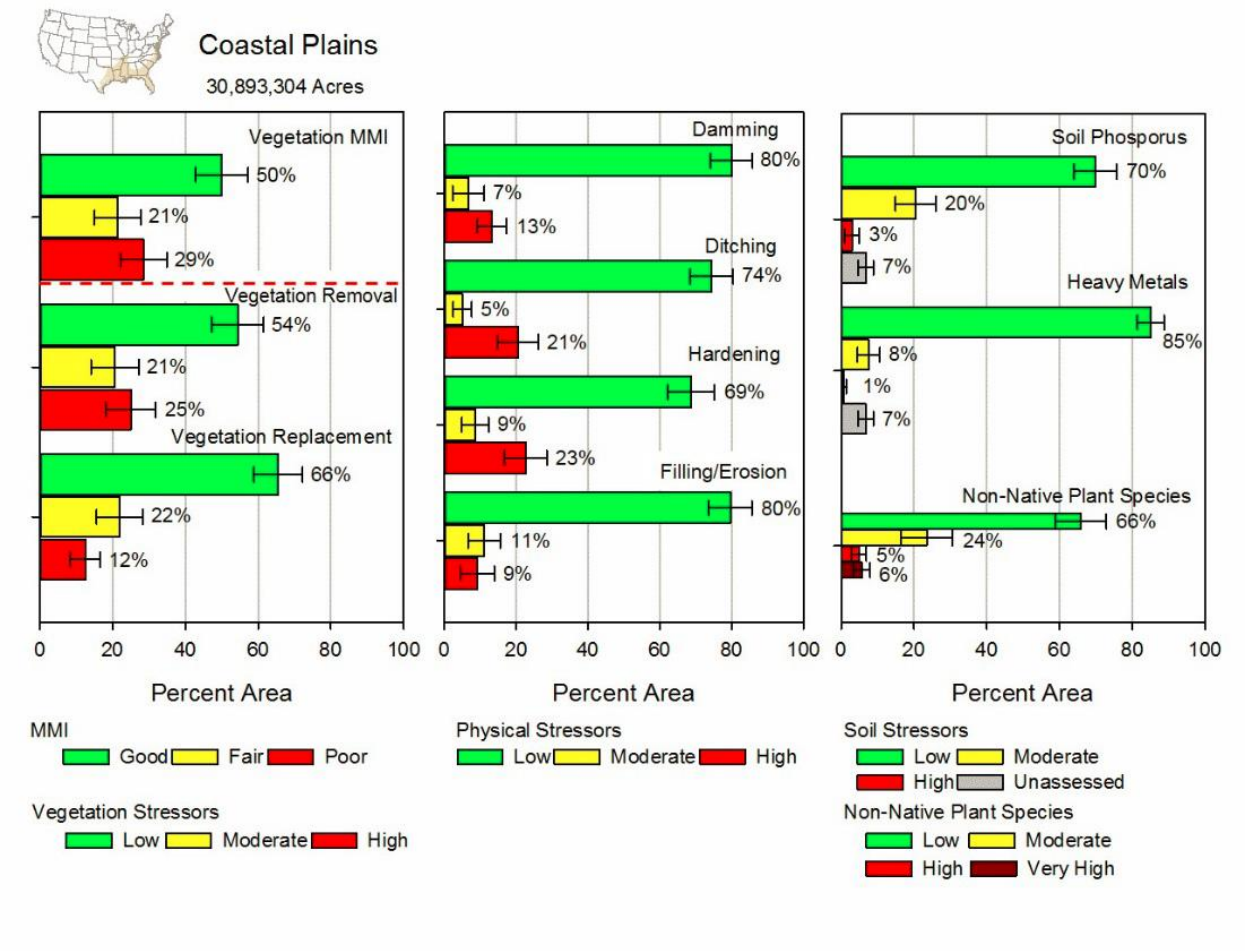


**Figure 3.2.9.**

National Wetland Condition Assessment 2011 survey results for the inland herbaceous wetlands across the Coastal Plains. (Bars show the percentage of wetland area within a condition or stressor class. Error bars represent 95% confidence intervals.) (USEPA 2016)

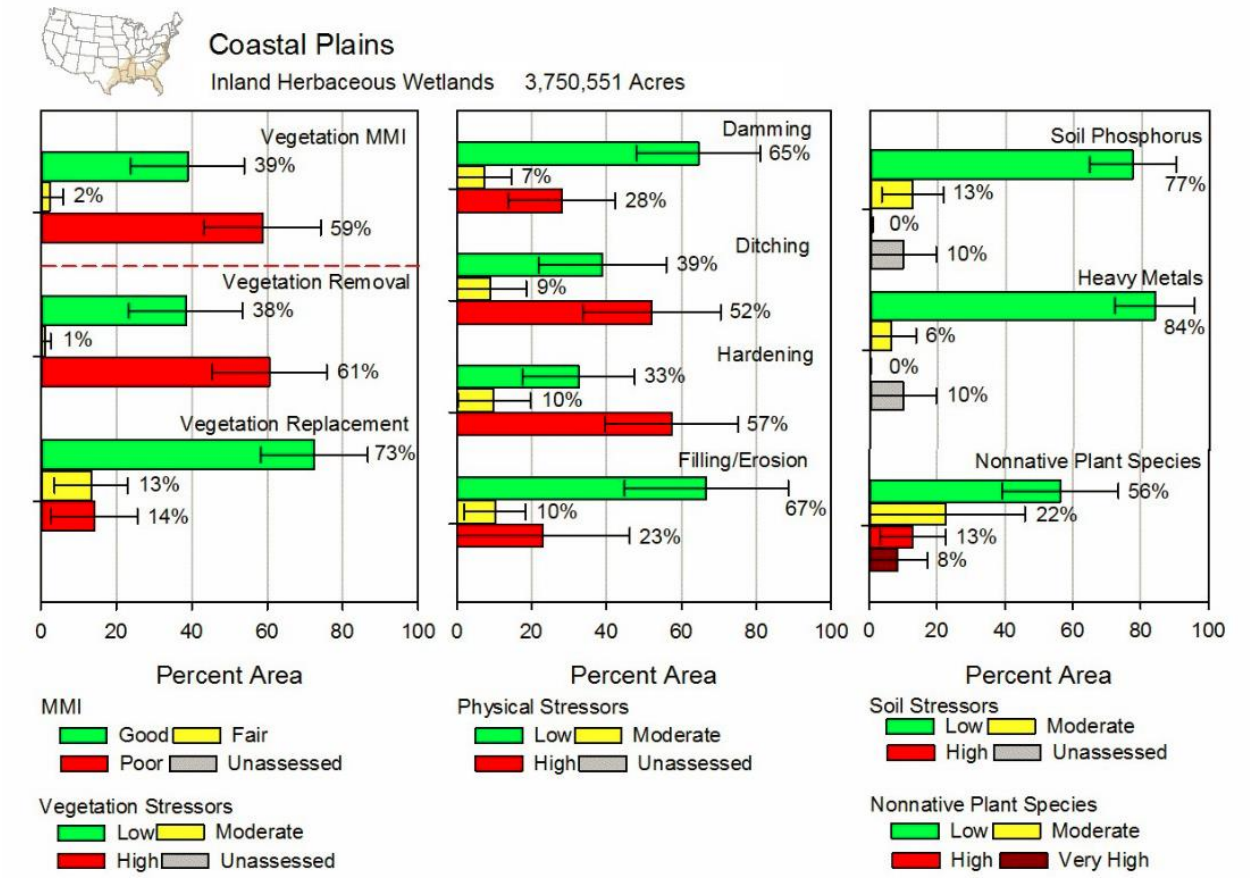
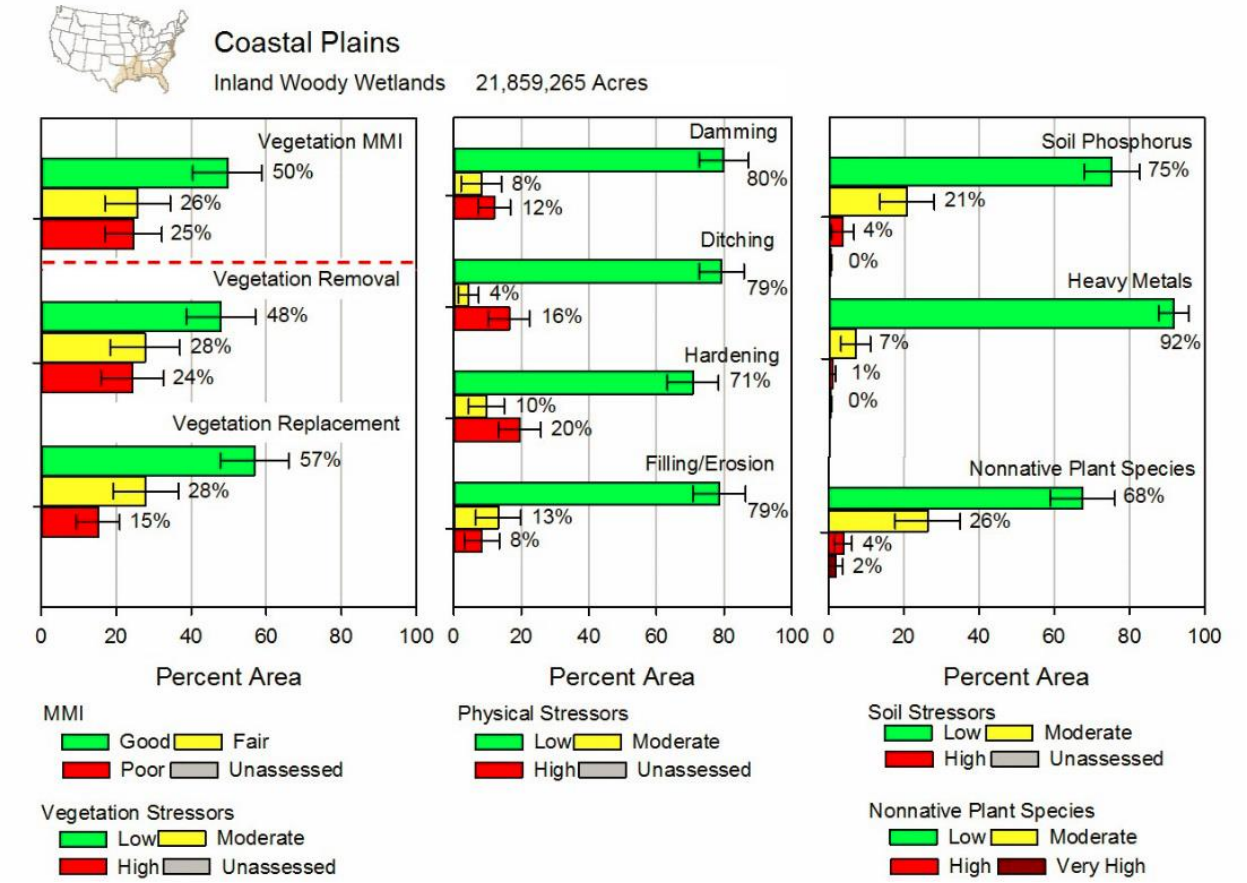


**Figure 3.2.10.**

National Wetland Condition Assessment 2011 survey results for the inland woody wetlands across the Coastal Plains. (Bars show the percentage of wetland area within a condition or stressor class. Error bars represent 95% confidence intervals.) (USEPA 2016)



Error bars for the following 11 figures represent upper and lower 95$^{th}$ percentile confidence limits.

**Figure 3.2.11.**
Stress to Louisiana wetlands due to ditching or channelization.

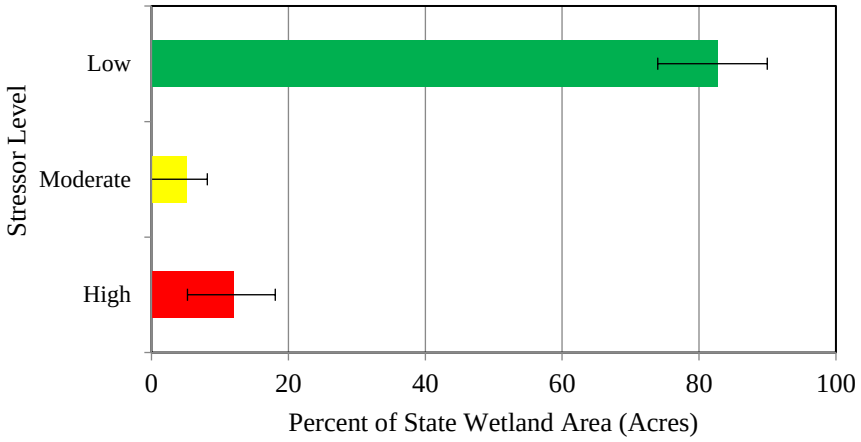



**Figure 3.2.12**.
Vegetation Condition (MMI) for Louisiana wetlands.

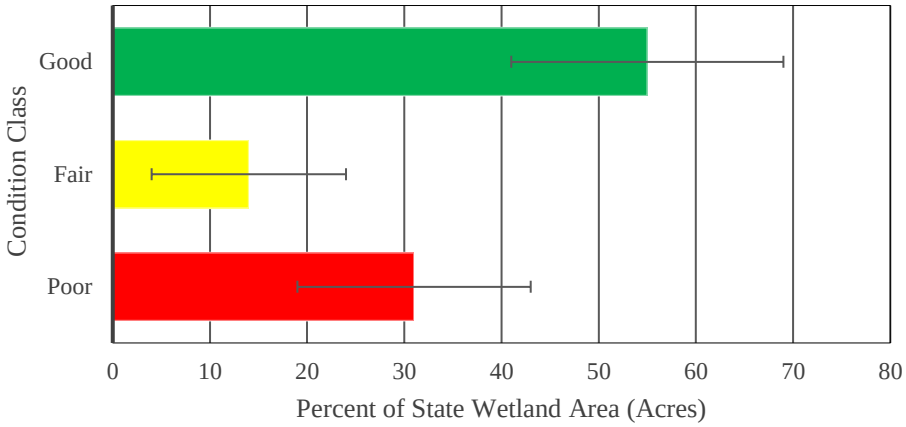


**Figure 3.2.13.**
Stress to Louisiana wetlands due to hardening.

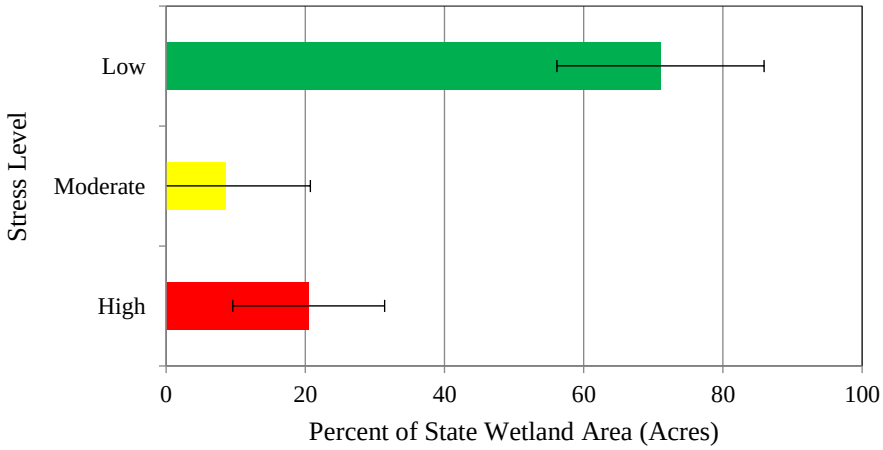



**Figure 3.2.14.**
Stress to Louisiana wetlands due to hydrologic alteration by damming.

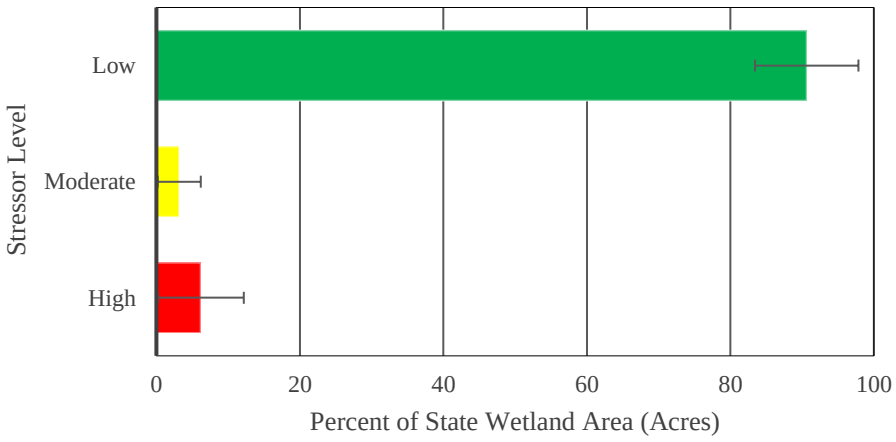


**Figure 3.2.15.**
Stress to Louisiana wetlands due to filling or erosion.


**Figure 3.2.16.**
Stress to Louisiana wetlands due to vegetative replacement.

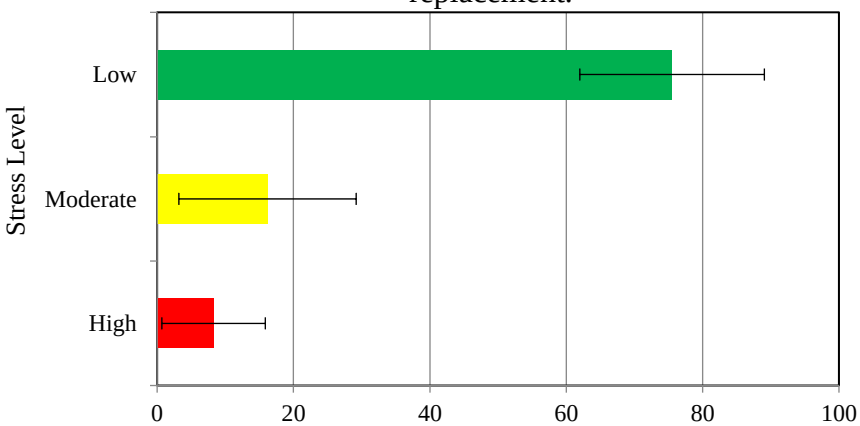


**Figure 3.2.17.**
Stress to Louisiana wetlands due to vegetative removal.

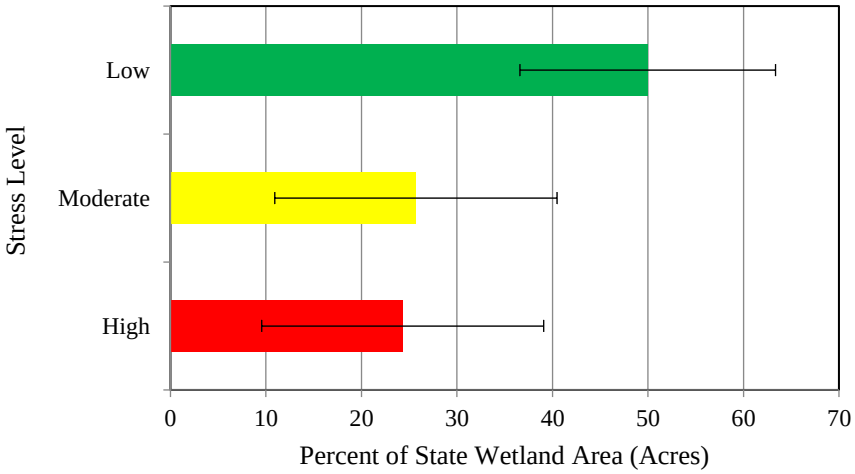



**Figure 3.2.18.**
Stress to Louisiana wetlands due to non-native vegetation.

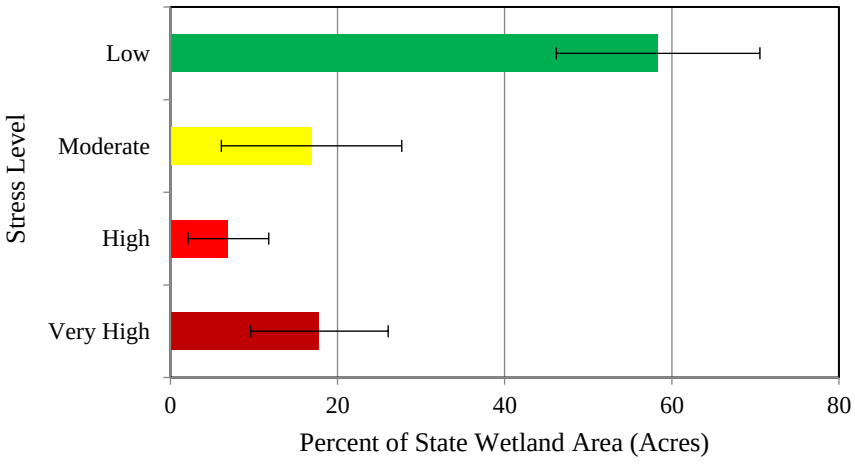


**Figure 3.2.19.**
Stress to Louisiana wetlands due to heavy metals.

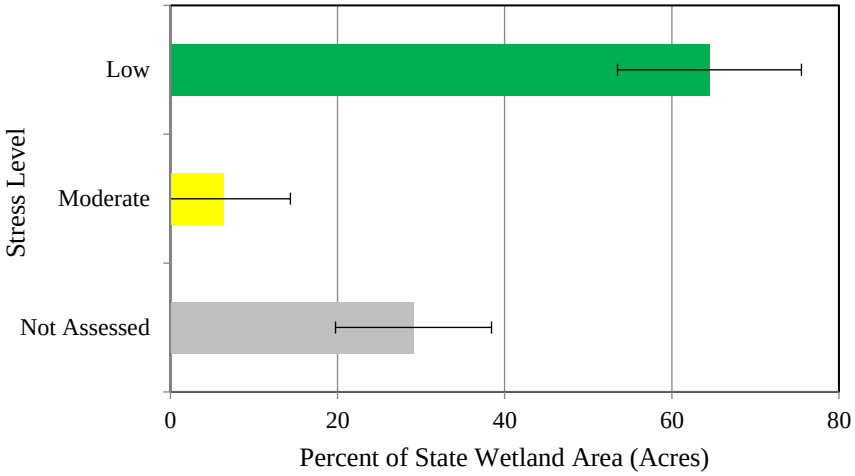



**Figure 3.2.20**.
Stress to Louisiana wetlands due to soil trace phosphorus.

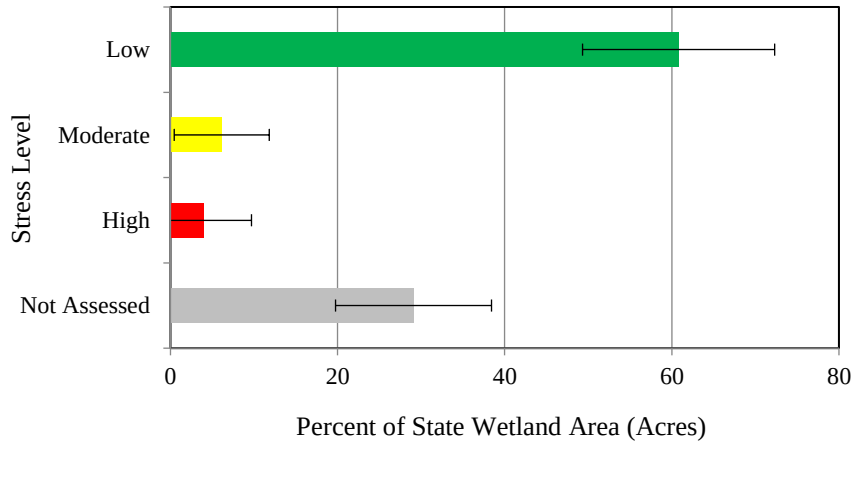
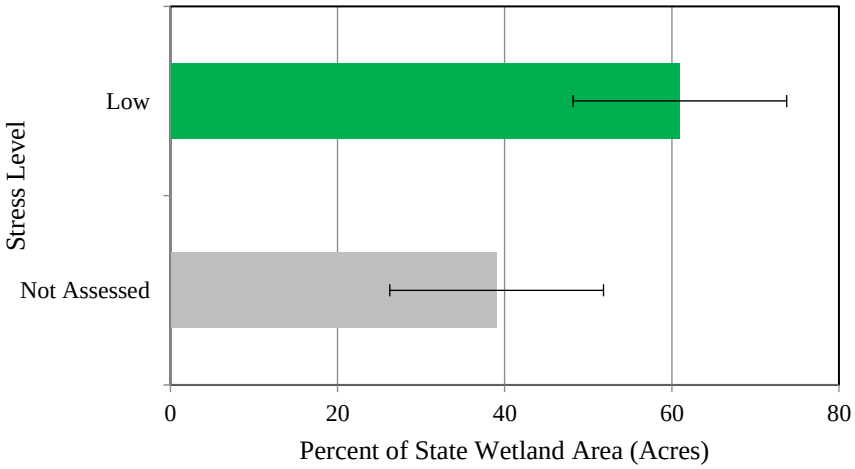


**Figure 3.2.21.**
Stress to Louisiana wetlands due to algal toxins.



# Chapter 3: River and Stream Water Quality Assessment

The information reported in Table 3.3.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The river miles and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.3.2. The miles and count impacted by various suspected sources of impairment are shown in Table 3.3.3. Tables 3.3.2 and 3.3.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact, and each subsegment may have multiple designated uses. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, Table 3, can be found in Appendix A.

**Table 3.3.1**

**Summary of designated use support for Louisiana rivers and streams, *2018 Integrated Report* assessment (reported in miles (water body count)).**

| Designated Use | Size Fully Supported[1] | | Size Not Supported[1] | | Size Not Assessed[1] | | Total Size for Designated Use[1] | |
|---|---|---|---|---|---|---|---|---|
| **Primary Contact Recreation** | 5,552 | (215) | 3,675 | (126) | 140 | (13) | 9,368 | (354) |
| **Secondary Contact Recreation** | 9,020 | (337) | 370 | (15) | 147 | (14) | 9,537 | (366) |
| **Fish and Wildlife Propagation** | 2,669 | (89) | 6,708 | (264) | 67 | (7) | 9,443 | (360) |
| **Drinking Water Supply** | 586 | (13) | 454 | (9) | | | 1,040 | (22) |
| **Limited Aquatic Life and Wildlife Use** | 28 | (3) | 59 | (2) | 7 | (1) | 94 | (6) |
| **Outstanding Natural Resource Waters** | 702 | (30) | 994 | (34) | 6 | (2) | 1,702 | (66) |
| **Oyster Propagation** | 199 | (12) | 388 | (17) | | | 587 | (29) |
| **Agriculture** | 2,042 | (59) | | | 10 | (1) | 2,052 | (60) |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

## Suspected Causes of Non-Support of Designated Uses

### Table 3.3.2

**Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected causes of impairment, *2018 Integrated Report* assessment (reported in miles (water body count)).**

| Suspected Cause of Impairment | Size[1] | Count |
|---|---|---|
| 1,1,1,2-Tetrachloroethane | 12 | 1 |
| 1,2-Dichloroethane | 59 | 2 |
| 2,3,7,8-Tetrachlorodibenzofuran | 70 | 2 |
| 2,3,7,8-Tetrachlorodibenzo-p-Dioxin | 70 | 2 |
| Atrazine | 43 | 1 |
| Benzo(a)Pyrene (PAHs) | 12 | 3 |
| Bromoform | 12 | 1 |
| Chloride | 236 | 19 |
| Color | 454 | 9 |
| Copper | 7 | 2 |
| Dioxin | 12 | 1 |
| Dioxin - Fish Consumption Advisory | 61 | 3 |
| Dissolved Oxygen | 4,175 | 165 |
| Enterococcus | 132 | 11 |
| Fecal Coliform | 3,894 | 124 |
| Furan Compounds | 61 | 3 |
| Lead | 259 | 8 |
| Mercury - Fish Consumption Advisory | 2,558 | 83 |
| Methyl Parathion | 43 | 1 |
| Nitrate/Nitrite (Nitrite + Nitrate As N) | 840 | 38 |
| Non-Native Aquatic Plants | 458 | 27 |
| PCBs - Fish Consumption Advisory | 61 | 3 |
| PCBs In Sediment | 12 | 1 |
| pH, High | 13 | 1 |
| pH, Low | 644 | 17 |
| Phenol | 4 | 1 |
| Phosphorus, Total | 774 | 36 |
| Polychlorinated Biphenyls (PCBs) | 4 | 1 |
| Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems) | 4 | 1 |
| Sulfate | 424 | 25 |
| Temperature | 100 | 9 |
| Total Dissolved Solids (TDS) | 1,355 | 60 |
| Turbidity | 2,569 | 77 |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

## Suspected Sources of Non-Support of Designated Uses

### Table 3.3.3

**Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2018 Integrated Report* assessment (reported in miles (water body count)).**

| Suspected Source of Impairment | Size[1] | Count |
|---|---|---|
| Agriculture | 2,360 | 65 |
| Animal Feeding Operations (NPS) | 40 | 1 |
| Atmospheric Deposition - Toxics | 2,558 | 83 |
| CERCLA NPL (Superfund) Sites | 12 | 3 |
| Changes In Tidal Circulation/Flushing | 4 | 1 |
| Construction | 17 | 2 |
| Construction Stormwater Discharge (Permitted) | 68 | 5 |
| Contaminated Sediments | 12 | 3 |
| Crop Production (Irrigated) | 75 | 2 |
| Crop Production (Non-Irrigated) | 92 | 3 |
| Discharges From Municipal Separate Storm Sewer Systems (MS4) | 104 | 5 |
| Dredging (e.g., for Navigation Channels) | 40 | 1 |
| Drought-Related Impacts | 269 | 14 |
| Erosion and Sedimentation | 132 | 2 |
| Forced Drainage Pumping | 42 | 4 |
| Highways, Roads, Bridges, Infrastructure (New Construction) | 7 | 1 |
| Impacts From Hydrostructure Flow Regulation/Modification | 74 | 2 |
| Industrial Point Source Discharge | 387 | 14 |
| Industrial/Commercial Site Stormwater Discharge (Permitted) | 4 | 1 |
| Introduction Of Non-Native Organisms (Accidental or Intentional) | 458 | 27 |
| Livestock (Grazing or Feeding Operations) | 404 | 11 |
| Managed Pasture Grazing | 26 | 1 |
| Manure Runoff | 68 | 2 |
| Marina/Boating Sanitary On-Vessel Discharges | 285 | 8 |
| Municipal (Urbanized High Density Area) | 77 | 3 |
| Municipal Point Source Discharges | 954 | 30 |
| Natural Conditions - Water Quality Standards Use Attainability Analyses Needed | 27 | 2 |
| Natural Sources | 3,320 | 142 |
| Naturally Occurring Organic Acids | 177 | 6 |
| Non-Point Source | 27 | 1 |
| On-Site Treatment Systems (Septic Systems and Similar Decentralized Systems) | 1,753 | 85 |
| Package Plant or Other Permitted Small Flows Discharges | 836 | 46 |
| Petroleum/Natural Gas Activities | 118 | 2 |

**Table 3.3.3**

**Total sizes of Louisiana rivers and streams not fully supporting designated uses due to various suspected sources of impairment, *2018 Integrated Report* assessment (reported in miles (water body count)).**

| Suspected Source of Impairment | Size[1] | Count |
|---|---|---|
| Petroleum/Natural Gas Production Activities (Permitted) | 15 | 1 |
| Residential Districts | 83 | 4 |
| Runoff From Forest/Grassland/Parkland | 180 | 7 |
| Rural (Residential Areas) | 307 | 10 |
| Sand/Gravel/Rock Mining or Quarries | 29 | 1 |
| Sanitary Sewer Overflows (Collection System Failures) | 304 | 11 |
| Seafood Processing Operations | 4 | 1 |
| Sediment Resuspension (Clean Sediment) | 112 | 8 |
| Sewage Discharges in Unsewered Areas | 979 | 25 |
| Silviculture Activities | 497 | 16 |
| Silviculture Harvesting | 39 | 3 |
| Site Clearance (Land Development or Redevelopment) | 216 | 9 |
| Source Unknown | 3,877 | 121 |
| Sources Outside State Jurisdiction or Borders | 107 | 4 |
| Transfer of Water From an Outside Watershed | 14 | 1 |
| Unrestricted Cattle Access | 18 | 1 |
| Upstream Source | 62 | 4 |
| Water Diversions | 144 | 5 |
| Waterfowl | 172 | 7 |
| Wetland Drainage | 40 | 2 |
| Wildlife Other Than Waterfowl | 399 | 17 |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

# Chapter 4: Lake Water Quality Assessment

The information reported in Table 3.4.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The lake acres and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.4.2. The acres and count impacted by various suspected sources of impairment are shown in Table 3.4.3. Tables 3.4.2 and 3.4.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, Table 3, can be found in Appendix A.

**Table 3.4.1**

**Summary of designated use support for Louisiana lakes, *2018 Integrated Report* assessment (reported in acres (water body count)).**

| Designated Use | Size Fully Supported[1] | Size Not Supported[1] | Size Not Assessed[1] | Total Size for Designated Use[1] |
|---|---|---|---|---|
| **Primary Contact Recreation** | 572,823 (51) | 27,140 (12) | 1,161 (2) | 601,124 (65) |
| **Secondary Contact Recreation** | 599,785 (61) | 178 (2) | 1,161 (2) | 601,124 (65) |
| **Fish and Wildlife Propagation** | 24,711 (10) | 575,252 (53) | 1,161 (2) | 601,124 (65) |
| **Drinking Water Supply** | 197,973 (9) | 48,390 (3) | | 246,363 (12) |
| **Outstanding Natural Resource Waters** | | 29 (1) | | 29 (1) |
| **Agriculture** | 377,056 (15) | | 361 (1) | 377,417 (16) |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

## Suspected Causes of Non-Support of Designated Uses

### Table 3.4.2

**Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected causes of impairment, *2018 Integrated Report* assessment (reported in acres (water body count)).**

| Suspected Cause of Impairment | Size[1] | Count |
|---|---|---|
| Arsenic | 24 | 1 |
| Chloride | 56,487 | 1 |
| Color | 48,390 | 3 |
| Dissolved Oxygen | 118,231 | 24 |
| Fecal Coliform | 23,493 | 11 |
| Hexachlorobenzene | 24 | 1 |
| Hexachlorobutadiene | 24 | 1 |
| Lead | 24 | 1 |
| Mercury | 24 | 1 |
| Mercury - Fish Consumption Advisory | 290,975 | 20 |
| Nitrate/Nitrite (Nitrite + Nitrate As N) | 5,461 | 4 |
| Non-Native Aquatic Plants | 306,355 | 16 |
| Oil And Grease | 24 | 1 |
| PCBs - Fish Consumption Advisory | 79 | 2 |
| pH, High | 16,808 | 4 |
| Phosphorus, Total | 5,461 | 4 |
| Temperature | 3,801 | 2 |
| Total Dissolved Solids (TDS) | 99,005 | 12 |
| Turbidity | 175,978 | 17 |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

## Suspected Sources of Non-Support of Designated Uses

### Table 3.4.3

**Total sizes of Louisiana lakes not fully supporting designated uses due to various suspected sources of impairment, *2018 Integrated Report* assessment (reported in acres (water body count)).**

| Suspected Source of Impairment | Size[1] | Count |
|---|---|---|
| Agriculture | 103,313 | 14 |
| Atmospheric Deposition - Toxics | 290,951 | 19 |
| Confined Animal Feeding Operations (NPS) | 4,734 | 1 |
| Construction Stormwater Discharge (Permitted) | 4,022 | 1 |
| Contaminated Sediments | 24 | 1 |
| Discharges From Municipal Separate Storm Sewer Systems (MS4) | 55 | 1 |
| Industrial Point Source Discharge | 12,735 | 2 |
| Industrial/Commercial Site Stormwater Discharge (Permitted) | 79 | 2 |
| Introduction Of Non-Native Organisms (Accidental or Intentional) | 306,355 | 16 |
| Municipal Point Source Discharges | 12,711 | 1 |
| Natural Sources | 192,073 | 23 |
| On-Site Treatment Systems (Septic Systems and Similar Decentralized Systems) | 7,439 | 2 |
| Package Plant or Other Permitted Small Flows Discharges | 2,462 | 3 |
| Pesticide Application | 1,685 | 1 |
| Runoff From Forest/Grassland/Parkland | 6,280 | 1 |
| Sediment Resuspension (Clean Sediment) | 1,217 | 1 |
| Sewage Discharges in Unsewered Areas | 20,732 | 11 |
| Shallow Lake/Reservoir | 3,133 | 1 |
| Silviculture Activities | 9,470 | 3 |
| Silviculture Harvesting | 4,022 | 1 |
| Site Clearance (Land Development or Redevelopment) | 4,022 | 1 |
| Source Unknown | 323,747 | 27 |
| Unspecified Land Disturbance | 2,184 | 1 |
| Upstream Source | 24 | 1 |
| Water Diversions | 9,894 | 1 |
| Waterfowl | 3,070 | 2 |
| Wetland Drainage | 883 | 1 |
| Wildlife Other Than Waterfowl | 1,384 | 1 |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

# Chapter 5: Estuary and Coastal Water Quality Assessment

The information reported in Table 3.5.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The estuary square miles and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.5.2. The square miles and count impacted by various suspected sources of impairment are shown in Table 3.5.3. Tables 3.5.2 and 3.5.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, Table 3, can be found in Appendix A.

**Table 3.5.1**

**Summary of designated use support for Louisiana estuaries, *2018 Integrated Report* assessment (reported in square miles (water body count)).**

| Designated Use | Size Fully Supported[1] | | Size Not Supported[1] | | Total Size for Designated Use[1] | |
|---|---|---|---|---|---|---|
| **Primary Contact Recreation** | 5,635 | (45) | 97 | (7) | 5,733 | (52) |
| **Secondary Contact Recreation** | 5,733 | (52) | | | 5,733 | (52) |
| **Fish and Wildlife Propagation** | 2,395 | (33) | 3,338 | (19) | 5,733 | (52) |
| **Oyster Propagation** | 3,345 | (29) | 1,664 | (11) | 5,009 | (40) |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

## Suspected Causes of Non-Support of Designated Uses

### Table 3.5.2

**Total sizes of Louisiana estuaries not fully supporting designated uses due to various suspected causes of impairment, *2018 Integrated Report* assessment (reported in square miles (water body count)).**

| Suspected Cause of Impairment | Size[1] | Count |
|---|---|---|
| Dioxin - Fish Consumption Advisory | 72 | 4 |
| Dissolved Oxygen | 2,080 | 11 |
| Enterococcus | 95 | 6 |
| Fecal Coliform | 1,666 | 12 |
| Furan Compounds | 72 | 4 |
| Mercury - Fish Consumption Advisory | 1,928 | 9 |
| Non-Native Aquatic Plants | 91 | 1 |
| PCBs - Fish Consumption Advisory | 72 | 4 |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

## Suspected Sources of Non-Support of Designated Uses

### Table 3.5.3

**Total sizes of Louisiana estuaries not fully supporting designated uses due to various suspected sources of impairment, *2018 Integrated Report* assessment (reported in square miles (water body count)).**

| Suspected Source of Impairment | Size[1] | Count |
|---|---|---|
| Atmospheric Deposition - Toxics | 1,928 | 9 |
| Discharges From Municipal Separate Storm Sewer Systems (MS4) | 2 | 1 |
| Industrial Point Source Discharge | 72 | 4 |
| Introduction Of Non-Native Organisms (Accidental or Intentional) | 91 | 1 |
| Marina/Boating Pumpout Releases | 191 | 1 |
| Natural Conditions - Water Quality Standards Use Attainability Analyses Needed | 483 | 2 |
| Natural Sources | 758 | 11 |
| Non-Point Source | 9 | 1 |
| On-Site Treatment Systems (Septic Systems and Similar Decentralized Systems) | 166 | 6 |
| Package Plant or Other Permitted Small Flows Discharges | 499 | 2 |

**Table 3.5.3**

**Total sizes of Louisiana estuaries not fully supporting designated uses due to various suspected sources of impairment, *2018 Integrated Report* assessment (reported in square miles (water body count)).**

| Suspected Source of Impairment | Size[1] | Count |
|---|---|---|
| Sanitary Sewer Overflows (Collection System Failures) | 3 | 2 |
| Sewage Discharges in Unsewered Areas | 198 | 2 |
| Source Unknown | 3,471 | 14 |
| Waterfowl | 153 | 4 |
| Wet Weather Discharges (Non-Point Source) | 2 | 1 |
| Wildlife Other Than Waterfowl | 84 | 4 |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

# Chapter 6: Wetland Water Quality Assessment

The information reported in Table 3.6.1 is based upon the reported use support for all applicable water body designated uses, as determined through monitoring data assessments. The wetland acres and subsegment counts of impaired water bodies identified as being impacted by various suspected causes of impairment are shown in Table 3.6.2. The acres impacted by various suspected sources of impairment are shown in Table 3.6.3. Tables 3.6.2 and 3.6.3 refer only to those water bodies that were assessed as not supporting designated uses. The tables are not ranked by order of impact. Assessment results for all water body subsegments, as defined in LAC 33:IX.1123, Table 3, can be found in Appendix A.

**Table 3.6.1**

**Summary of designated use support for Louisiana wetlands, *2018 Integrated Report* assessment (reported in acres (water body count)).**

| Designated Use | Size Fully Supported[1] | Size Not Supported[1] | Size Not Assessed[1] | Total Size for Designated Use[1] |
|---|---|---|---|---|
| **Primary Contact Recreation** | 1,024,574 (6) | | | 1,024,574 (6) |
| **Secondary Contact Recreation** | 1,024,574 (6) | | 51,773 (10) | 1,076,347 (16) |
| **Fish and Wildlife Propagation** | 827,090 (10) | 245,417 (5) | 3,840 (1) | 1,076,347 (16) |
| **Drinking Water Supply** | | 464,000 (1) | | 464,000 (1) |
| **Oyster Propagation** | | 72,320 (1) | | 72,320 (1) |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

## Suspected Causes of Non-Support of Designated Uses

**Table 3.6.2**

**Total sizes of Louisiana wetlands not fully supporting designated uses due to various suspected causes of impairment, *2018 Integrated Report* assessment (reported in acres (water body count)).**

| Suspected Cause of Impairment | Size[1] | Count |
|---|---|---|
| Cause Unknown | 39,403 | 3 |
| Chloride | 6,974 | 1 |
| Color | 464,000 | 1 |
| Dissolved Oxygen | 199,040 | 1 |
| Fecal Coliform | 72,320 | 1 |

**Table 3.6.2**

**Total sizes of Louisiana wetlands not fully supporting designated uses due to various suspected causes of impairment, *2018 Integrated Report* assessment (reported in acres (water body count)).**

| Suspected Cause of Impairment | Size[1] | Count |
|---|---|---|
| Mercury - Fish Consumption Advisory | 199,040 | 1 |
| Sulfate | 6,974 | 1 |
| Total Dissolved Solids (TDS) | 6,974 | 1 |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

## Suspected Sources of Non-Support of Designated Uses

**Table 3.6.3**

**Total sizes of Louisiana wetlands not fully supporting designated uses due to various suspected sources of impairment, *2018 Integrated Report* assessment (reported in acres (water body count)).**

| Suspected Source of Impairment | Size[1] | Count |
|---|---|---|
| Atmospheric Deposition - Toxics | 199,040 | 1 |
| Natural Sources | 206,014 | 2 |
| Source Unknown | 702,443 | 5 |
| Waterfowl | 72,320 | 1 |
| Wildlife Other Than Waterfowl | 72,320 | 1 |

1. Water body sizes are different from those found in prior Integrated Reports due to a change in how subsegment sizes were calculated using more accurate Geographic Information System (GIS) mapping systems.

# Chapter 7: Public Health/Aquatic Life Concerns

## Fishing and Swimming Advisories Currently in Effect

LDEQ currently issues fish consumption and swimming advisories in conjunction with the LDH Health/Fish Consumption Advisories Program. Fish consumption advisories are set using a risk assessment-based method that establishes consumption levels designed to prevent adverse effects on public health. Risk assessments are used to determine safe consumption levels for different segments of the population. For example, children, women of childbearing age, or breastfeeding women are often considered separately in developing risk assessments because this population is generally considered to be at greater risk from consumption of contaminated seafood. Therefore, limited consumption advisories will often be stricter for this population.

Swimming advisories are generally established due to fecal coliform contamination of a water body. However, a limited number of swimming advisories have been based on chemical contamination of water or sediments. Fecal coliform contamination of a water body can be caused by a number of possible sources including absent or inadequate sewage treatment systems, poorly maintained septic tanks, direct sewage discharges from camps, pasture and animal holding area runoff, and wildlife. Efforts are being made to correct these problems statewide. For the latest information on advisories please refer to LDEQ's website at: http://deq.louisiana.gov/page/fishing-consumption-and-swimming-advisories.

# PART IV: GROUNDWATER ASSESSMENT

## Introduction

The LDEQ, WPAD, Aquifer Sampling and Assessment Program (ASSET) provides water quality data from freshwater aquifers around the state. The ASSET Program is an ambient groundwater monitoring program designed to determine and monitor the quality of groundwater produced from Louisiana's major freshwater aquifers. The ASSET Program samples approximately 200 water wells located in 14 aquifers and aquifer systems across the state. The sampling process is designed so that all 14 aquifers and aquifer systems are monitored on a rotating basis, within a three year period so that each well is monitored every three years.

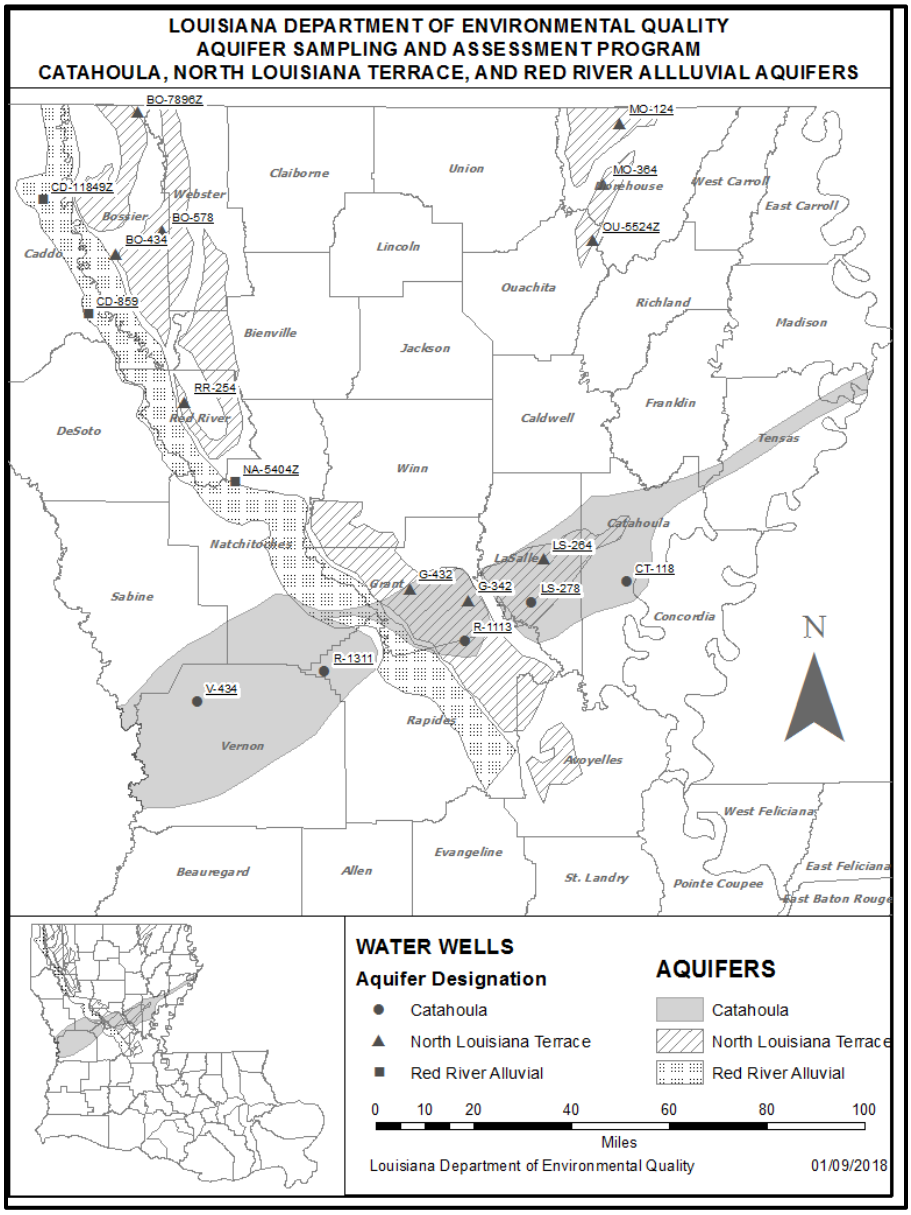
The USEPA has encouraged states to select an aquifer or hydrogeologic setting and discuss available data that best reflects the quality of the resource. Data presented for this report is from ASSET Program monitoring data collected in calendar year 2016 from the Catahoula, Red River Alluvial, and North Louisiana Terrace aquifers (Figure 4.1.1). While these aquifers are not from a common hydrogeologic setting, they were chosen for the 2018 reporting period because these aquifers have not been reported in previous Integrated Reports. Table 4.1.1 shows that the Red River Alluvial and North Louisiana Terrace aquifers are Pleistocene age and are located in the northern and northwestern areas of the state. The Catahoula is an Oligocene age aquifer and is found across the central area of Louisiana. This table also shows the hydrogeologic column of aquifers in Louisiana and the occurrence of these aquifers in relation to each other and in regard to the other freshwater aquifers in the state.

Table 4.1.2 is designed to provide an indication of the most critical contaminant sources and contaminants impacting groundwater resources in Louisiana. Table 4.1.3 provides a summary of Louisiana groundwater protection programs with listing of legislation, statutes, rules, and/or regulations that are in place. It also provides an indication of the comprehensive nature of groundwater protection activities in Louisiana. Table 4.1.4 provides information on the number of wells used for this report, the number of wells reporting non-detects for parameter groups of interest, and a more detailed look at the occurrence of nitrite-nitrate (NO2NO3). Table 4.1.5 lists the wells sampled, their total depths, the use made of produced waters, and date sampled. For quality control, duplicate samples were taken for each parameter at wells BO-578 and LS-264 (North Louisiana Terrace aquifer), NA-5404Z (Red River Alluvial aquifer), and V-434 (Catahoula aquifer).

Table 4.1.6 lists the field and conventional parameters, and Table 4.1.7 lists the inorganic (total metals) parameters for which samples were collected. They also detail the analytical results for those parameters for each well. Table 4.1.8 lists the field and conventional parameters' statistical values for minimum, maximum and average concentrations, while Table 4.1.9 provides a listing of inorganic statistics of minimum, maximum, and average values. It should be noted that per departmental standard procedure, one-half the detection limit is used when determining averages when a non-detect (ND) is reported. This procedure is utilized throughout the groundwater portion (**Part IV**) of this report whenever average values are listed or discussed. Also note that the terms Laboratory Detection Limit, Detection Limit, and Reporting Detection Limit, are used interchangeably in **Part IV** of this report.

**Figure 4.1.1**

**Location Plat of the Catahoula, North Louisiana Terrace, and Red River Alluvial aquifers and associated water wells.**




## Ambient Monitoring Network for the Catahoula, Red River Alluvial, and North Louisiana Terrace Aquifer

The data that follow were derived from the ASSET Program, which is conducted as a Clean Water Act activity. The objectives of the program are to determine and monitor the quality of groundwater produced from the freshwater aquifers across Louisiana, and to provide water quality data to the department, other state and federal agencies, and the corporate and private citizens of Louisiana.

Data contained in Table 4.1.5 show that from January through October 2016, 18 wells were sampled which produce from the Catahoula, North Louisiana Terrace, and Red River Alluvial aquifers. Twelve of the wells are classified as public supply, four are classified as domestic, one industrial, and one is classified as irrigation.

Non-analytical well information for registered water wells, such as depth, use categorization, and aquifer assignment were obtained from the LDNR Strategic Online Natural Resources Information System (SONRIS).

As noted above these three aquifers were selected for this reporting period because their water quality data have not been reported or discussed in previous Integrated Reports. They are presented separately in the geological and hydrogeological discussion that follows.

## Catahoula Aquifer (5 Wells)

### Geology

The Catahoula formation (Figure 4.1.1) consists primarily of sands with some silty to sandy clays and overlies the regional confining clays of the Vicksburg and Jackson groups. Within the Catahoula, fine to coarse sands are discontinuous and interbedded with silt and clay.

### Hydrogeology

Recharge takes place primarily as a result of the direct infiltration of rainfall in interstream, upland outcrop area, movement of water through overlying terrace deposits, and leakage from other aquifers. Salt water ridges under the Red River and Little River valleys in central Louisiana divide the Catahoula aquifer. The hydraulic conductivity of the Catahoula varies between 20 and 260 feet/day.

The maximum depths of occurrence of fresh water in the Catahoula range from 250 feet above sea level, to 2,200 feet below sea level. The range of thickness of the fresh water interval in the Catahoula is 50 to 450 feet. The depths of the Catahoula wells that were monitored in conjunction with the ASSET Program range from 352 to 910 feet.

## Red River Alluvial Aquifer (3 Wells)

### Geology

Red River alluvium (Figure 4.1.1) consists of fining upward sequences of gravel, sand, silt, and clay. The aquifer is poorly to moderately well sorted, with fine-grained to medium-grained sand near the top, grading to coarse sand and gravel in the lower portions.

### Hydrogeology

The Red River Alluvial aquifer is hydraulically connected with the Red River and its major streams. Recharge is accomplished by direct infiltration of rainfall in the river valley, lateral and upward movement of water from adjacent and underlying aquifers, and overbank stream flooding. The amount of recharge from rainfall depends on the thickness and permeability of the silt and clay layers overlying it. Water levels fluctuate seasonally in response to precipitation trends and river stages.

Water levels are generally within 30 to 40 feet of the land surface and movement is downgradient and toward rivers and streams. Natural discharge occurs by seepage of water into the Red River and its streams, but some water moves into the aquifer when stream stages are above aquifer water levels. The hydraulic conductivity varies between 10 and 530 feet/day.

The maximum depths of occurrence of freshwater in the Red River Alluvial range from 20 feet above sea level, to 160 feet below sea level. The range of thickness of the fresh water interval in the Red River Alluvial is 50 to 200 feet. The depths of the Red River Alluvial wells that were monitored in conjunction with the ASSET Program range from 47 to 76 feet.

## North Louisiana Terrace Aquifer (10 Wells)

### Geology

The Pleistocene Terrace aquifers (Figure 4.1.1) that make up the North Louisiana Terrace aquifer occur as blanket terrace deposits in central Louisiana and as erosional remnants of dissected terraces northward. The Prairie, intermediate, and high terraces typically consist of unconsolidated, fining upward sequences of gravel, sand, silt, and clay and are overlain by Holocene alluvium in the valleys of the larger streams. The older terraces generally have a coarser texture and the fine-grained top stratum is often eroded. The aquifer deposits are typically poorly to well sorted and consist of coarse sand and gravel in the lower parts grading to fine sand toward the top. The North Louisiana Terrace is unconfined in most areas, but may be confined by silt and clay locally.

### Hydrogeology

Recharge is primarily from the direct infiltration of rainfall in interstream, upland outcrop areas and can be relatively rapid where the overlying silts and clays are thin or missing. Water in the terrace aquifers moves downgradient and laterally and is discharged into streams that have eroded valleys into the aquifer units. Water levels typically reflect variations in precipitation and seasonal withdrawals by wells. The hydraulic conductivity of the North Louisiana Terrace varies between 150 and 270 feet/day.

The maximum depths of occurrence of freshwater in the North Louisiana Terrace range from 100 feet above sea level, to 100 feet below sea level. The range of thickness of the fresh water interval in the North Louisiana Terrace is 50 to 150 feet. The depths of the North Louisiana Terrace wells that were monitored in conjunction with the ASSET Program range from 49 to 158.

## Program Parameters

The field parameters checked at each sampling site and the list of conventional parameters analyzed in the laboratory are shown in Table 4.1.6 The inorganic (total metals) parameters analyzed in the laboratory are listed in Table 4.1.7 These tables also show the field and analytical results determined for those analytes. Tables 4.1.8 and 4.1.9 provide a statistical overview of conventional and inorganic data for these aquifers, listing the minimum, maximum, and average results for these parameters. Table 4.1.10 lists the Federal Maximum Contaminant Level (primary and secondary) and Action Level (AL) for applicable parameters.

In addition to the conventional and inorganic analytical parameters, the target analyte list includes three other categories of compounds: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and pesticides/PCBs. Due to the large number of analytes in these

categories, tables were not prepared showing the analytical results for these compounds. A discussion of detections from any of these three categories, if necessary, can be found in their respective sections. Tables 4.1.11, 4.1.12, and 4.1.13 list the target analytes and detection limits for volatiles, semi-volatiles and pesticides/PCBs, respectively.

Figure 4.1.1 shows the geographic locations of the shows the geographic locations of the Catahoula, North Louisiana Terrace, and Red River Alluvial aquifers and their associated wells.

## Interpretation of Data

Under the Federal Safe Drinking Water Act, EPA has established maximum contaminant levels (MCLs) for pollutants that may pose a health risk in public drinking water. An MCL is the highest level of a contaminant that EPA allows in public drinking water. MCLs ensure that drinking water does not pose either a short-term or long-term health risk. While not all wells sampled were public supply wells, the ASSET Program does use MCLs as a benchmark for further evaluation. A review of laboratory data contained in Tables 4.1.6 and 4.1.7 shows that no well exceeded a primary MCL.

EPA has also set secondary standards, which are defined as non-enforceable taste, odor, or appearance guidelines. Field and laboratory data contained in Tables 4.1.6 and 4.1.7 show that one or more Secondary MCLs (SMCLs) were exceeded in 12 of the 18 wells sampled in these three aquifers, with a total of 19 SMCLs being exceeded.

In addition to primary and secondary MCLs, EPA has established action levels for particular compounds. If the action levels are exceeded, then a treatment technique is required by public water supply systems to control the corrosiveness of the distributed water. The data show that one industrial use well, G-342, exceeded the action level for lead, however the well in question is an industrial use well, so no treatment is required.

The ASSET Program also considers hardness values (reported as mg/L of CaCO3) along with drinking water standards in assessing quality of groundwater produced from an aquifer. The hardness classification ranges are based on the hardness scale from: Peavy, H. S. et al., Environmental Engineering, 1985, which are:

Soft ≤ 50 mg/L
Moderately Hard >50 mg/L –150 mg/L
Hard >150 mg/L– 300 mg/L
Very Hard >300 mg/L

Average hardness for the combined aquifers is 138 mg/L, which is in the moderately hard range. Groundwater produced from the Catahoula aquifer is considered to be soft with an average hardness value of 6 mg/L. The average hardness value of groundwater produced from the North Louisiana Terrace aquifer is 111 mg/L, which is moderately hard, while groundwater produced from the Red River Alluvial aquifer is very hard with an average hardness value of 415 mg/L.

## Field and Conventional Parameters

Table 4.1.6 shows the field and conventional parameters for which samples are collected at each well and the analytical results for field and laboratory parameters. Table 4.1.8 provides an

overview of these parameters, listing the minimum, maximum, and average results for these parameters.

## Federal Primary Drinking Water Standards

A review of the analysis listed in Table 4.1.6 shows that no primary MCL was exceeded for field and conventional parameters. Those ASSET wells reporting turbidity levels greater than 1.0 NTU do not exceed the Primary MCL of 1.0, as this standard applies to surface water systems and groundwater systems under the direct influence of surface water. The Louisiana Department of Health has determined that no public supply well in Louisiana is in this category.

## Federal Secondary Drinking Water Standards

A review of the analysis listed in Table 4.1.6 shows that three wells exceeded the SMCL for pH, one well exceeded the SMCL for color, and three wells exceeded the SMCL for total dissolved solids (TDS). Laboratory results override field results in exceedance determinations, thus only lab results will be counted in determining SMCL exceedance numbers for TDS. Following is a list of SMCL parameter exceedances with well number and results:

***pH (SMCL = 6.5 – 8.5 Standard Units):***
G-432 – 5.73 SU OU-5524Z – 6.10 SU
RR-254 – 6.49 SU

***Color (SMCL = 15 PCU)***
CT-118 – 30 PCU

***Total Dissolved Solids (SMCL = 500 mg/L):***
CD-11849Z – 960 mg/L MO-364 – 896 mg/L
NA5404Z – 510 mg/L (Original), 550 mg/L (Duplicate)

## Inorganic Parameters

Table 4.1.7 shows the inorganic (total metals) parameters for which samples are collected at each well and the analytical results for those parameters. Table 4.1.9 provides an overview of inorganic data, listing the minimum, maximum, and average results for these parameters.

## Federal Primary Drinking Water Standards

A review of the analyses listed on Table 4.1.7 shows that no primary MCLs were exceeded for inorganic (total metals) parameters. As previously stated, one industrial use well, G-342, exceeded the action level for lead, but because the well in question is an industrial use well, no treatment is required.

## Federal Secondary Drinking Water Standards

Laboratory data contained in Table 4.1.7 show that nine wells exceeded the secondary MCL for iron.

***Iron (SMCL = 300 µg/L):***

BO-578 – 660 µg/L (Original and Duplicate)
BO-7896Z – 1,420 µg/L
CD-11849Z – 4,150 µg/L
CD-859 – 5,880 µg/L
CT-118 – 3,670 µg/L
G-342 – 5,160 µg/L
LS-278 – 806 µg/L
MO-364 – 310 µg/L
NA-5404Z – 13,500 µg/L (Original), 13,700 µg/L (Duplicate)

## Volatile Organic Compounds

Table 4.1.11 shows the volatile organic compound (VOC) parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any confirmed detection of a VOC would be discussed in this section.

There were no confirmed detections of VOCs at or above their laboratory reporting detection limit during the sampling of these wells.

## Semi-Volatile Organic Compounds

Table 4.1.12 shows the SVOC parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any confirmed detection of a SVOC would be discussed in this section.

There were no confirmed detections of any SVOC at or above its laboratory reporting detection limit during the sampling of these wells.

## Pesticides and PCBs

Table 4.1.13 shows the pesticide and PCB parameters for which samples are collected at each well. Due to the number of analytes in this category, analytical results are not tabulated; however, any detection of a pesticide or PCB would be discussed in this section.

There were no confirmed detections of any pesticide or PCB at or above its laboratory reporting detection limit during the sampling of these wells.

## Summary

In summary, the combined aquifer data show that the groundwater produced from these aquifers is moderately hard. Taken individually, data show that groundwater produced from the Catahoula aquifer is soft, the groundwater produced from the North Louisiana Terrace aquifer is moderately hard, and the groundwater produced from the Red River Alluvial aquifer is very hard. Combined aquifer data also show the groundwater is of good quality when considering short term or long term health based risk exposure limits in that no primary MCL was exceeded. Combined aquifer data show that the groundwater produced from these aquifers is of fair to good quality based on taste, odor or appearance guidelines, with a total 19 SMCLs exceeded in 12 of the 18 wells sampled.

## Table 4.1.1

## Hydrogeologic column of aquifers in Louisiana.

| SYSTEM | SERIES | Stratigraphic Unit | | Hydrogeologic Unit: Northern Louisiana — Aquifer or confining unit | Central and southwestern Louisiana — Aquifer system or confining unit | Central and southwestern Louisiana — Aquifer or confining unit: Lake Charles area | Central and southwestern Louisiana — Aquifer or confining unit: Rice growing area | Southeastern Louisiana — Aquifer system or confining unit | Southeastern Louisiana — Aquifer[1] or confining unit: Baton Rouge area | Southeastern Louisiana — Aquifer[1] or confining unit: St. Tammany, Tangipahoa, and Washington Parishes | Southeastern Louisiana — Aquifer[1] or confining unit: New Orleans area and lower Mississippi River parishes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Quaternary | Pleistocene | Red River alluvial deposits<br>Miss. River alluvial deposits<br>Northern La. Terrace deposits<br>Unnamed Pleistocene deposits | | Red River alluvial aquifer or surficial confining unit<br>Mississippi River alluvial aquifer or surficial confining unit<br>Upland terrace aquifer or surficial confining unit | Chicot aquifer system or surficial confining unit | "200-foot" sand | Upper sand unit | Chicot Equivalent aquifer system[2] or surficial confining unit | Mississippi River alluvial aquifer or surficial confining unit<br>Shallow sand<br>"400-foot" sand<br>"600-foot" sand | Upland terrace aquifer<br>Upper Ponchatoula aquifer | Gramercy aquifer[3]<br>Norco aquifer[3]<br>Gonzales-New Orleans Aquifer[3]<br>"1,200-foot" sand[3] |
| | | | | | | "500-foot" sand<br>"700-foot" sand | Lower sand unit | | | | |
| Tertiary | Pliocene<br>-----?-----<br>Miocene | Fleming Formation | Blounts Creek Member | Pliocene-Miocene aquifers are absent in this area | Evangeline aquifer or surficial confining unit | | | Evangeline equivalent aquifer system[2] or surficial confining unit | "800-foot" sand<br>"1,000-foot" sand<br>"1,200-foot" sand<br>"1,500-foot" sand<br>"1,700-foot" sand | Lower Ponchatoula Aquifer<br>Big Branch aquifer<br>Kentwood aquifer<br>Abita aquifer<br>Covington aquifer<br>Slidell aquifer | |
| | | | Castor Creek Member | | Castor Creek confining unit | | | Unnamed confining unit | "2,000-foot" sand<br>"2,400-foot" sand<br>"2,800-foot" sand | Tchefuncte aquifer<br>Hammond aquifer<br>Amite aquifer<br>Ramsay aquifer<br>Franklinton aquifer | |
| | | | Williamson Creek Member<br>Dough Hills Member<br>Carnahan Bayou Member | | Jasper aquifer system or surficial confining unit | Williamson Creek aquifer<br>Dough Hills confining unit<br>Carnahan Bayou aquifer | | Jasper equivalent aquifer system[2] or surficial confining unit | | | |
| | | | Lena Member | | Lena confining unit | | | Unnamed confining unit | | | |
| | -----?-----<br>Oligocene | Catahoula Formation | | | Catahoula aquifer | | | *Catahoula equivalent aquifer system[2] or surficial confining unit | | | |
| | | Vicksburg Group, undifferentiated | | Vicksburg-Jackson confining unit | | | | | | | |
| | **Eocene** | Jackson Group, undifferentiated | | | | | | | | | |
| | | Claiborne Group | Cockfield Formation | Cockfield aquifer or surficial confining unit | | | | | | | |
| | | | Cook Mountain Formation | Cook Mountain aquifer or confining unit | | | | | | | |
| | | | Sparta Sand | Sparta aquifer or surficial confining unit | | | | | | | |
| | | | Cane River Formation | Cane River aquifer or confining unit | | | | | | | |
| | | | Carrizo Sand | Carrizo-Wilcox aquifer or surficial confining unit | | | | | | | |
| | **Paleocene** | Wilcox Group, undifferentiated | | | | | | | | | |
| | | Midway Group, undifferentiated | | Midway confining unit | | | | | | | |

**No fresh water occurs in older aquifers**

[1]Clay units separating aquifers in southeastern Louisiana are discontinuous and unnamed.
[2]Four aquifer systems as a group are called the Southern Hills aquifer system (*Catahoula equivalent aquifer system is not monitored by the ASSET Program).
[3]Four aquifers as a group are called the New Orleans aquifer system.

*Source: DOTD/USGS Water Resources Special Report No. 9, 1995*

Index to Table 4.1.2

Factors in selecting a contaminant source

A. Human health and/or environmental risk (toxicity)
B. Size of the population at risk
C. Location of the sources relative to drinking water sources
D. Number and/or size of contaminant sources
E. Hydrogeologic sensitivity
F. State findings, other findings
G. Documented from mandatory reporting
H. Geographic distribution/occurrence
I. Other criteria - high to very high priority in localized areas of the state

Contaminants

A. Inorganic pesticides
B. Organic pesticides
C. Halogenated solvents
D. Petroleum compounds
E. Nitrate
F. Fluoride
G. Salinity/brine
H. Metals
I. Radionuclides
J. Bacteria
K. Protozoa
L. Viruses
M. Other - sulfates from gypsum stacks

**Table 4.1.2**
**Major sources of groundwater contamination in the freshwater aquifers of Louisiana.**

| Contaminant Source | Ten Highest-Priority Sources(√) | Factors in Selecting a Contaminant Source | Contaminants |
|---|---|---|---|
| ***Agricultural Activities*** | | | |
| Agricultural chemical facilities | | | |
| Animal feedlots | | | |
| Drainage wells | | | |
| Fertilizer applications | | | |
| Irrigation practices | | | |
| Pesticide applications | | | |
| On-farm agricultural mixing and loading procedures | | | |
| Land application of manure (unregulated) | | | |
| ***Storage and Treatment*** | | | |
| Land Application | | | |
| Material stockpiles | | | |
| Storage tanks (above ground) | √ | A,B,C,D,E,F,G | B,C,D |
| Storage tanks (underground) | √ | A,B,C,D,E,F, | B,C,D |
| Surface impoundments | √ | A,B,C,D,E,F,G | C,D,G,H,J,L |
| Waste piles | √ | D,G | I,M |
| Waste tailings | | | |
| ***Disposal Activities*** | | | |
| Deep injection wells | | | |
| Landfills | √ | A,B,C,D,E,F,G | A,B,C,D,E,H |
| Septic systems | √ | C,D,G | A,B,C,D,E,H,J,L |
| Shallow injection wells | | | |
| ***Other*** | | | |
| Hazardous waste generators* | | | |
| Hazardous waste sites* | | | |
| Industrial facilities* | | | |
| Material transfer operations* | | | |
| Mining and mine drainage | | | |
| Pipelines and sewer lines | √ | A,B,C,D,E,F,G | C,D,G |
| Salt storage and road salting | | | |
| Salt water intrusion | √ | B,C,E,G | G |
| Spills | √ | B,D,G | C,D |
| Transportation of materials | | | |
| Urban runoff | √ | A,B,D,G | A,B,C,D,E,H,J,L |
| Small-scale manufacturing and repair shops | | | |
| Other sources (please specify) | | | |

* Represents facilities with multiple sources of groundwater contamination rather than unit sources.

**Table 4.1.3**
**State groundwater protection programs for Louisiana with their implementations status.**

| Programs or Activities | Check | Implementation Status | Responsible State Agency |
|---|---|---|---|
| Active SARA[1] Title III Program | √ | Fully established | LDEQ |
| Ambient groundwater monitoring system | √ | Fully established | LDEQ |
| Aquifer vulnerability assessment | √ | Fully established | LDEQ |
| Aquifer mapping | √ | Fully established | LDEQ |
| Aquifer characterization | √ | Continuing efforts | LDOTD |
| Comprehensive data management system | √ | Continuing efforts | LDEQ |
| EPA-endorsed Core Comprehensive State Ground Water Protection Program | √ | Pending | LDEQ |
| Groundwater discharge permits | √ | Fully established | LDNR(UIC) |
| Groundwater Best Management Practices | √ | Continuing efforts | LDEQ |
| Groundwater legislation | √ | Continuing efforts | LDNR |
| Groundwater classification | √ | Continuing efforts | LDNR |
| Groundwater quality standards | √ | Continuing efforts | LDEQ |
| Interagency coordination for groundwater protection initiatives | √ | Continuing efforts | LDNR |
| Nonpoint source controls | √ | Continuing efforts | LDEQ |
| Pesticide State Management Plan | √ | Fully Established | LDAF |
| Pollution Prevention Program | √ | Continuing efforts | LDEQ |
| Resource Conservation and Recovery Act (RCRA) Primacy | √ | Fully established | LDEQ |
| Source Water Assessment Program | √ | Fully established | LDEQ |
| State Superfund | √ | Fully established | LDEQ |
| State RCRA Program incorporating more stringent requirements than RCRA Primacy | √ | Continuing efforts | LDEQ |
| State septic system regulations | √ | Fully established | LDH |
| Underground storage tank installation requirements | √ | Fully established | LDEQ |
| Underground Storage Tank Remediation Fund | √ | Fully established | LDEQ |
| Underground Storage Tank Permit Program | √ | Fully established | LDEQ |
| Underground Injection Control Program | √ | Fully established | LDNR |
| Vulnerability assessment for drinking water/wellhead protection | √ | Fully established | LDEQ |
| Well abandonment regulations | √ | Fully established | LDNR |
| Wellhead Protection Program (EPA-approved) | √ | Fully established | LDEQ |
| Well installation regulations | √ | Fully established | LDNR |

1. Superfund Amendments and Reauthorization Act

## Table 4.1.4

## Monitoring Data

Hydrogeologic Setting: **Catahoula, North Louisiana Terrace, and Red River Alluvial aquifers**
Spatial Description: **North and Central Louisiana**
Map Available: **See Figure 4.1.1**
Data Reporting Period: **January 2016-October 2016**

| Monitoring Data Type | Total No. of Wells Used in the Assess-ment | Parameter Groups | Number of Wells | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | No detections of parameters above Method Detection Limits (MDLs) or background levels | | Nitrite/nitrate concentrations range from background levels to less than or equal to 5 mg/l. No detections of parameters other than nitrite/nitrate above MDLs or background levels and/or located in areas that are sensitive or vulnerable. | | | Nitrite/nitrate ranges from greater than 5 to less than or equal to 10 mg/l. Other parameters are detected at concentrations exceeding the MDL but are less than or equal to the MCLs. | Parameters are detected at concentrations exceeding the MCLs | Number of wells removed from service | Number of wells requiring special treatment | Back-ground para-meters exceed MCLs |
| | | | Non-Detect (ND) | Number of wells in sensitive or vulnerable areas | Nitrite/ nitrate < 1 mg/l | Nitrite/ nitrate ≥ 1 to ≤5 mg/l | Number of wells in sensitive or vulnerable areas | | | | | |
| Ambient Monitoring Network | 18 | VOC | 18 | 0 | | | 0 | 0 | 0 | 0 | 0 | 0 |
| | | SVOC | 18 | 0 | | | 0 | 0 | 0 | 0 | 0 | 0 |
| | | NO2NO3 | 9 | 0 | 7 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | †Other | 0 | 0 | | | 0 | 19 | 0 | 0 | 0 | 0 |

† For Other category, the following metals with Primary Drinking Water Standards or Action Levels were considered: Antimony, Arsenic, Barium, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Selenium, and Thallium.

## Table 4.1.5

**List of ASSET wells sampled.**

| LDNR Well Number | Parish | Date Sampled | Owner | Aquifer Member | Depth (Feet) | Well Use |
|---|---|---|---|---|---|---|
| BO-434 | Bossier | 8/3/2016 | Consolidated WW#1 of Bossier | North Louisiana Terrace Aquifer | 94 | Public Supply |
| BO-578 | Bossier | 8/2/2016 | Village Water System | North Louisiana Terrace Aquifer | 85 | Public Supply |
| BO-7896Z | Bossier | 8/2/2016 | Private Owner | North Louisiana Terrace Aquifer | 96 | Domestic |
| CD-11849Z | Caddo | 1/20/2016 | Private Owner | Red River Alluvial Aquifer | 47 | Domestic |
| CD-859 | Caddo | 1/19/2016 | East Ridge Country Club | Red River Alluvial Aquifer | 58 | Irrigation |
| CT-118 | Catahoula | 5/19/2016 | City of Jonesville | Catahoula Aquifer | 762 | Public Supply |
| G-342 | Grant | 10/26/2016 | PPM Consultants | North Louisiana Terrace Aquifer | 49 | Industrial |
| G-432 | Grant | 7/6/2016 | Central Grant Water System | North Louisiana Terrace Aquifer | 158 | Public Supply |
| LS-264 | La Salle | 5/19/2016 | City of Jena | North Louisiana Terrace Aquifer | 105 | Public Supply |
| LS-278 | La Salle | 5/19/2016 | Rogers Water System | Catahoula Aquifer | 352 | Public Supply |
| MO-124 | Morehouse | 5/18/2016 | Texas Gas | North Louisiana Terrace Aquifer | 133 | Public Supply |
| MO-364 | Morehouse | 5/18/2016 | Peoples Water Service | North Louisiana Terrace Aquifer | 154 | Public Supply |
| NA-5404Z | Natchitoches | 2/16/2016 | Seven C's Ranch | Red River Alluvial Aquifer | 76 | Domestic |
| OU-5524Z | Ouachita | 5/18/2016 | Private Owner | North Louisiana Terrace Aquifer | 95 | Domestic |
| R-1113 | Rapides | 7/6/2016 | Pollock Area Water System | Catahoula Aquifer | 852 | Public Supply |
| R-1311 | Rapides | 6/16/2016 | Lena Water System, Inc. | Catahoula Aquifer | 514 | Public Supply |
| RR-254 | Red River | 8/3/2016 | East Cross Water System | North Louisiana Terrace Aquifer | 93 | Public Supply |
| V-434 | Vernon | 9/7/2016 | Town of Anacoco | Catahoula Aquifer | 910 | Public Supply |

**Table 4.1.6**
**Field measurements and conventional laboratory analytical results for parameters sampled.**

| Field, Analytical Parameters, and Units | Field Measures | | | | | Conventional Laboratory Parameters | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH SU | Sal. ppth | Sp. Cond. mmhos | TDS g/L | Temp Deg. C | Alk mg/L | Cl mg/L | Color PCU | Hard. mg/L | Nitrite-Nitrate | TKN mg/L | Tot. P mg/L | Sp. Cond. µmhos/cm | SO4 mg/L | TDS mg/L | TSS mg/L | Turb. NTU |
| **Drinking Water Limit and Type** | **≥6.5, ≤8.5** | **N/A** | **N/A** | **0.5** | **N/A** | **N/A** | **250 (S)** | **15 (S)** | **N/A** | **10 (P)** | **N/A** | **N/A** | **N/A** | **250 (S)** | **500 (S)** | **N/A** | **(TT)** |
| **Well Number↓** | **Laboratory Detection Limits →** | | | | | **2** | **10/1.0** | **5** | **5** | **0.05** | **0.10** | **0.05** | **1** | **1.0** | **10** | **4.0** | **0.1** |
| BO-434 | 6.67 | 0.11 | 0.224 | 0.146 | 13.21 | 82 | 11.1 | < 5 | 100 | 0.65 | 0.11 | 0.30 | 177 | 4.6 | 135 | < 4.0 | 1.1 |
| BO-578 | 7.40 | 0.21 | 0.427 | 0.277 | 14.04 | 144 | 26.5 | 5 | 140 | < 0.05 | 0.40 | 0.23 | 325 | < 1.0 | 190 | < 4.0 | 2.9 |
| BO-578* | 7.40 | 0.21 | 0.427 | 0.277 | 14.04 | 154 | 26.3 | 5 | 160 | < 0.05 | 0.42 | 0.24 | 252 | 11.2 | 215 | < 4.0 | 4.7 |
| BO-7896Z | 6.80 | 0.37 | 0.747 | 0.485 | 13.65 | 277 | 49.8 | 5 | 360 | < 0.05 | 0.36 | 0.28 | 457 | 15.3 | 410 | 4.0 | 16.5 |
| CD-11849Z | Field Measures Not Recorded | | | | | 460 | 125.0 | 10 | 640 | < 0.05 | 0.85 | 0.40 | 1,360 | 180.0 | **960§** | 4.0 | 43.8 |
| CD-859 | | | | | | 517 | 7.8 | 10 | 370 | < 0.05 | 0.56 | 0.37 | 698 | 17.7 | 460 | 15.0 | 70.0 |
| CT-118 | 7.34 | 0.16 | 0.325 | 0.211 | 18.08 | 121 | 19.7 | **30§** | 14 | < 0.05 | 0.41 | 0.06 | 321 | 5.1 | 270 | < 4.0 | 1.8 |
| G-342 | 6.82 | 0.05 | 0.112 | 0.073 | R | 10 | 11.3 | 10 | 18 | 3.90 | < 0.10 | < 0.05 | 58 | 5.2 | 90 | 8.0 | 33.7 |
| G-432 | **5.73§** | 0.03 | 0.059 | 0.038 | 14.29 | 10 | 3.8 | 10 | 16 | 0.52 | 1.10 | < 0.05 | 51 | < 1.0 | 20 | < 4.0 | 0.4 |
| LS-264 | 6.64 | 0.11 | 0.241 | 0.157 | 16.08 | 37 | 13.1 | 5 | 24 | 0.76 | < 0.10 | 0.16 | NR | 15.1 | 84 | < 4.0 | 0.2 |
| LS-264* | 6.64 | 0.11 | 0.241 | 0.157 | 16.08 | 37 | 13.3 | 5 | 26 | 0.75 | 0.15 | 0.16 | 168 | 15.1 | 122 | < 4.0 | 0.6 |
| LS-278 | 7.55 | 0.10 | 0.220 | 0.143 | 17.13 | 98 | 3.7 | 10 | < 5 | < 0.05 | 0.33 | 0.48 | 224 | 3.7 | 445 | < 4.0 | 3.2 |
| MO-124 | 6.87 | 0.15 | 0.319 | 0.208 | 16.08 | 84 | 43.2 | < 5 | 96 | 1.00 | 0.28 | 0.15 | 329 | < 1.0 | 212 | < 4.0 | 1.7 |
| MO-364 | 6.55 | 0.82 | 1.621 | 1.054 | 16.71 | 273 | 322.0 | < 5 | 282 | 0.06 | 0.27 | 0.65 | 217 | 37.3 | **896§** | < 4.0 | 1.5 |
| NA-5404Z | 6.72 | 0.47 | 0.954 | 0.620 | 16.79 | 393 | 83.2 | 15 | 330 | 0.05 | 2.10 | 1.10 | 919 | < 1.0 | **510§** | 27.0 | 258.0 |
| NA-5404Z* | 6.72 | 0.47 | 0.954 | 0.620 | 16.79 | 371 | 83.0 | 10 | 320 | 0.06 | 2.20 | 1.20 | 797 | < 1.0 | **550§** | 30.0 | 199.0 |
| OU-5524Z | **6.10§** | 0.07 | 0.144 | 0.093 | 14.72 | 30 | 19.3 | 5 | 32 | 0.10 | 0.21 | 0.09 | 146 | 2.3 | 128 | < 4.0 | 1.4 |
| R-1113 | 8.13 | 0.19 | 0.393 | 0.256 | 20.83 | 139 | 33.4 | 10 | < 5 | < 0.05 | 0.33 | 0.34 | 379 | < 1.0 | 225 | < 4.0 | 1.2 |
| R-1311 | 7.67 | 0.14 | 0.303 | 0.197 | 19.39 | 109 | 12.6 | < 5 | 12 | < 0.05 | 0.69 | 0.90 | 307 | 18.0 | 255 | < 4.0 | 0.6 |
| RR-254 | **6.49§** | 0.11 | 0.221 | 0.144 | 13.86 | 43 | 33.5 | < 5 | 80 | 0.41 | < 0.10 | < 0.05 | 179 | 1.8 | 150 | < 4.0 | 0.3 |
| V-434 | 8.07 | 0.15 | 0.308 | 0.200 | 19.28 | 129 | 9.3 | < 5 | < 5 | < 0.05 | 0.40 | 0.15 | 297 | 9.2 | 265 | < 4.0 | 3.6 |
| V-434* | 8.07 | 0.15 | 0.308 | 0.200 | 19.30 | 129 | 9.3 | < 5 | < 5 | < 0.05 | 0.72 | 0.11 | 337 | 9.2 | 290 | < 4.0 | 1.3 |

(P) – Primary; (S) – Secondary; (TT) – Treatment
NR – Not reported by lab; R – Data Rejected
* Denotes Duplicate Sample; **§** – Exceeds USEPA Secondary Standard

**Table 4.1.7**

**Laboratory analytical results for the inorganic (Total Metals) parameters sampled.**

| Analytical Parameters and Units | Antimony µg/L | Arsenic µg/L | Barium µg/L | Beryllium µg/L | Cadmium µg/L | Chromium µg/L | Copper µg/L | Iron µg/L | Lead µg/L | Mercury µg/L | Nickel µg/L | Selenium µg/L | Silver µg/L | Thallium µg/L | Zinc µg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Laboratory Detection Limits** | **1.0** | **1.0** | **1.0** | **1/0.5** | **1.0** | **1.0** | **3.0** | **50** | **1** | **0.20** | **1.0** | **1.0** | **0.50** | **0.50** | **5.0** |
| **Drinking Water Limit and Type** | **6 (P)** | **10 (P)** | **2,000 (P)** | **4 (P)** | **5 (P)** | **100 (P)** | **1,300 (AL)** | **300 (S)** | **15 (AL)** | **2 (P)** | **N/A** | **50 (P)** | **N/A** | **2 (P)** | **5,000 (S)** |
| **Well Number↓** | | | | | | | | | | | | | | | |
| BO-434 | < 1.0 | 1.2 | 66.2 | < 0.50 | < 1.0 | < 1.0 | 17.4 | < 50 | 3.1 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | 26.2 |
| BO-578 | < 1.0 | < 1.0 | 239.0 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | **660§** | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| BO-578* | < 1.0 | < 1.0 | 240.0 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | **660§** | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| BO-7896Z | < 1.0 | 2.1 | 477.0 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | **1,420§** | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| CD-11849Z | < 1.0 | 7.1 | 143.0 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | **4,150§** | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| CD-859 | < 1.0 | < 1.0 | 352.0 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | **5,880§** | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| CT-118 | < 1.0 | < 1.0 | 9.0 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | **3,670§** | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | 10.5 |
| G-342 | < 1.0 | < 1.0 | 95.5 | < 0.50 | < 1.0 | 1.8 | 15.0 | **5,160§** | **17.5‡** | < 0.20 | 1.3 | < 1.0 | < 0.50 | < 0.50 | 5.3 |
| G-432 | < 1.0 | < 1.0 | 47.2 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | < 50 | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| LS-264 | < 1.0 | < 1.0 | 45.4 | < 0.50 | < 1.0 | 1.3 | 10.1 | < 50 | 2.7 | < 0.20 | 1.7 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| LS-264* | < 1.0 | < 1.0 | 44.3 | < 0.50 | < 1.0 | 1.5 | 12.0 | < 50 | 2.8 | < 0.20 | 1.9 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| LS-278 | < 1.0 | < 1.0 | 3.7 | < 0.50 | < 1.0 | < 1.0 | 4.9 | **806§** | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | 14.8 |
| MO-124 | < 1.0 | < 1.0 | 128.0 | < 0.50 | < 1.0 | 1.0 | 4.7 | 269 | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | 8.3 |
| MO-364 | < 1.0 | < 1.0 | 379.0 | < 0.50 | < 1.0 | 1.0 | < 3.0 | **310§** | < 1.0 | < 0.20 | 5.2 | < 1.0 | < 0.50 | < 0.50 | 14.5 |
| NA-5404Z | < 1.0 | < 1.0 | 549.0 | < 0.50 | < 1.0 | 3.3 | 7.9 | **13,500§** | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| NA-5404Z* | < 1.0 | < 1.0 | 559.0 | < 0.50 | < 1.0 | < 1.0 | 4.3 | **13,700§** | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| OU-5524Z | < 1.0 | < 1.0 | 44.4 | < 0.50 | < 1.0 | 1.4 | 6.1 | 241 | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| R-1113 | < 1.0 | < 1.0 | 3.4 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | < 50 | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| R-1311 | < 1.0 | < 1.0 | 13.5 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | < 50 | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| RR-254 | < 1.0 | < 1.0 | 46.1 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | < 50 | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| V-434 | < 1.0 | < 1.0 | 1.0 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | < 50 | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |
| V-434* | < 1.0 | < 1.0 | 1.1 | < 0.50 | < 1.0 | < 1.0 | < 3.0 | 68 | < 1.0 | < 0.20 | < 1.0 | < 1.0 | < 0.50 | < 0.50 | < 5.0 |

(P) – Primary, (S) – Secondary, (AL) – Action Level

*Denotes Duplicate Sample; **§** – Exceeds USEPA Secondary Standard; **‡** – Exceeds USEPA Action Level

## Table 4.1.8

**Field and conventional statistics for ASSET wells sampled in**

| | Parameter | Minimum | Maximum | Average |
|---|---|---|---|---|
| Field | Temperature ($^{O}$C) | 13.21 | 20.83 | 16.33 |
| | pH (SU) | 5.73 | 8.13 | 7.02 |
| | Specific Conductance (mmhos/cm) | 0.059 | 1.621 | 0.427 |
| | Salinity (ppt) | 0.03 | 00.82 | 0.21 |
| | TDS (g/L) | 0.038 | 1.054 | 0.278 |
| Conventional | Alkalinity (mg/L) | 10 | 517 | 166 |
| | Chloride (mg/L) | 3.7 | 322.0 | 43.6 |
| | Color (PCU) | < 5 | 30 | 7.4 |
| | Specific Conductance (umhos/cm) | 51 | 1,360 | 389 |
| | Sulfate (mg/L) | < 1.0 | 180.0 | 16.1 |
| | TDS (mg/L) | 20 | 960 | 313 |
| | Total Suspended Solids (TSS) (mg/L) | < 4 | 30 | 5.5 |
| | Turbidity (NTU) | 0.2 | 258.0 | 29.4 |
| | Hardness (mg/L) | <1 | < 3.5 | 640 |
| | Nitrite - Nitrate, as N (mg/L) | < 0.05 | 3.90 | 0.39 |
| | Total Kjeldahl Nitrogen (TKN) (mg/L) | < 0.01 | 2.20 | 0.62 |
| | Total Phosphorus (mg/L) | < 0.05 | 1.20 | 0.34 |

## Table 4.1.9

**Inorganic (Total Metals) statistics for ASSET wells sampled in the Southern Hills Aquifer System.**

| Parameter | Minimum | Maximum | Average |
|---|---|---|---|
| Antimony (µg/L) | < 1.0 | < 1.0 | < 1.0 |
| Arsenic (µg/L) | < 1.0 | 7.1 | < 1.0 |
| Barium (µg/L) | 1.0 | 559.0 | 158.5 |
| Beryllium (µg/L) | < 0.50 | < 0.50 | < 0.50 |
| Cadmium (µg/L) | < 1.0 | < 1.0 | < 1.0 |
| Chromium (µg/L) | < 1.0 | 3.3 | < 1.0 |
| Copper (µg/L) | < 3.0 | 17.4 | 4.6 |
| Iron (µg/L) | < 50 | 13,700 | 2,304 |
| Lead (µg/L) | < 1.0 | 17.5 | 1.6 |
| Mercury (µg/L) | < 0.20 | < 0.20 | < 0.20 |
| Nickel (µg/L) | < 1.0 | 5.2 | < 1.0 |
| Selenium (µg/L) | < 1.0 | < 1.0 | < 1.0 |
| Silver (µg/L) | < 0.50 | < 0.50 | < 0.50 |
| Thallium (µg/L) | < 0.50 | < 0.50 | < 0.50 |
| Zinc (µg/L) | < 5.0 | 26.2 | 5.4 |

## Table 4.1.10

**LDEQ ASSET Program field parameters, conventional, and inorganic analytes with applicable USEPA National Primary (MCL) and Secondary (SMCL) Drinking Water Standards and Action Levels (AL).**

| Parameter/Analyte | | MCL Type / Limit | Unit |
|---|---|---|---|
| Field | Temperature (Temp) | - | Degrees C. |
| | pH | SMCL / ≥ 6.5, ≤ 8.5 | SU |
| | Specific Conductance (Sp. Cond.) | - | mmhos/cm |
| | Salinity (Sal.) | - | ppth |
| | Total Dissolved Solids (TDS) | SMCL / 0.5 | g/L |
| Conventional | Alkalinity (Alk) | - | mg/L |
| | Chloride (Cl) | SMCL / 250 | mg/L |
| | Color | SMCL / 15 | PCU |
| | Specific Conductance (Sp. Cond.) | - | umhos/cm |
| | Sulfate (SO4) | SMCL / 250 | mg/L |
| | Total Dissolved Solids (TDS) | SMCL / 500 | mg/L |
| | Total Suspended Solids (TSS) | - | mg/L |
| | Turbidity (Turb) | *MCL / 1 | NTU |
| | Ammonia (NH3) | - | mg/L |
| | Hardness (Hard) | - | mg/L |
| | Nitrite-Nitrate (NO2NO3) | MCL / 10 | mg/L |
| | Total Kjeldahl Nitrogen (TKN) | - | mg/L |
| | Total Phosphorus (Tot. P) | - | mg/L |
| Inorganics (Total Metals) | Antimony | MCL / 6 | µg/L |
| | Arsenic | MCL / 10 | µg/L |
| | Barium | MCL / 2,000 | µg/L |
| | Beryllium | MCL / 4 | µg/L |
| | Cadmium | MCL / 5 | µg/L |
| | Chromium | MCL / 100 | µg/L |
| | Copper | AL / 1,300 | µg/L |
| | Iron | SMCL / 300 | µg/L |
| | Lead | AL / 15 | µg/L |
| | Mercury | MCL / 2 | µg/L |
| | Nickel | - | µg/L |
| | Selenium | MCL / 50 | µg/L |
| | Silver | SMCL / 100 | µg/L |
| | Thallium | MCL / 2 | µg/L |
| | Zinc | SMCL / 5,000 | µg/L |

MCL = Primary Maximum Contaminant Level; SMCL = Secondary Maximum Contaminant Level; AL = Action Level

* Only applies to public water supply systems with surface water source, or groundwater source under the direct influence of surface water. Louisiana Department of Health has determined that no public water supply well falls in this category.

## Table 4.1.11

**ASSET Program Volatile Organic Compounds analyte list with method and detection limits.**

| Compound | Method | Detection Limits (µg/L) |
|---|---|---|
| 1,1,1-Trichloroethane | 624 | 0.5 |
| 1,1,2,2-Tetrachloroethane | 624 | 0.5 |
| 1,1,2- Trichloroethane | 624 | 0.5 |
| 1,1-Dichloroethane | 624 | 0.5 |
| 1,1- Dichloroethene | 624 | 0.5 |
| 1,2,3-Trichlorobenzene | 624 | 1.0 |
| 1,2-Dichlorobenzene | 624 | 0.5 |
| 1,2-Dichloroethane | 624 | 0.5 |
| 1,2-Dichloropropane | 624 | 0.5 |
| 1,3- Dichlorobenzene | 624 | 0.5 |
| 1,4-Dichlorobenzene | 624 | 0.5 |
| Benzene | 624 | 0.5 |
| Bromodichloromethane | 624 | 0.5 |
| Bromoform | 624 | 0.5 |
| Bromomethane | 624 | 0.5 |
| Carbon Tetrachloride | 624 | 0.5 |
| Chlorobenzene | 624 | 0.5 |
| Chloroethane | 624 | 0.5 |
| Chloroform | 624 | 0.5 |
| Chloromethane | 624 | 0.5 |
| cis-1,3-Dichloropropene | 624 | 0.5 |
| Dibromochloromethane | 624 | 0.5 |
| Ethyl Benzene | 624 | 0.5 |
| Methylene Chloride | 624 | 0.5 |
| o-Xylene | 624 | 1.0 |
| Styrene | 624 | 1.0 |
| Methyl-t-Butyl Ether | 624 | 0.5 |
| Tetrachloroethene | 624 | 0.5 |
| Toluene | 624 | 0.5 |
| trans-1,2-Dichloroethene | 624 | 0.5 |
| trans-1,3-Dichloropropene | 624 | 0.5 |
| Trichloroethene | 624 | 0.5 |
| Trichlorofluoromethane | 624 | 0.5 |
| Vinyl Chloride | 624 | 0.5 |
| m & p-Xylenes | 624 | 2.0 |

## Table 4.1.12

**ASSET Program Semi-Volatile Organic Compounds analyte list with method and detection limits.**

| Compound | Method | Detection Limits (µg/L) |
|---|---|---|
| 1,2,4-Trichlorobenzene | 625 | 10 |
| 2,4,6-Trichlorophenol | 625 | 10 |
| 2,4-Dichlorophenol | 625 | 10 |
| 2,4-Dimethylphenol | 625 | 10 |
| 2,4-Dinitrophenol | 625 | 10 |
| 2,4-Dinitrotoluene | 625 | 10 |
| 2,6-Dinitrotoluene | 625 | 10 |
| 2-Chloronaphthalene | 625 | 10 |
| 2-Chlorophenol | 625 | 10 |
| 2-Nitrophenol | 625 | 10 |
| 3,3'-Dichlorobenzidine | 625 | 5 |
| 4,6-Dinitro-2-Methylphenol | 625 | 10 |
| 4-Bromophenyl Phenyl Ether | 625 | 10 |
| 4-Chloro-3-Methylphenol | 625 | 10 |
| 4-Chlorophenyl Phenyl Ether | 625 | 10 |
| 4-Nitrophenol | 625 | 10 |
| Acenaphthene | 625 | 10 |
| Acenaphthylene | 625 | 10 |
| Anthracene | 625 | 10 |
| Benzidine | 625 | 30 |
| Benzo(a)Anthracene | 625 | 5 |
| Benzo(a)Pyrene | 625 | 5 |
| Benzo(b)Fluoranthene | 625 | 10 |
| Benzo(g,h,i)Perylene | 625 | 10 |
| Benzo(k)Fluoranthene | 625 | 5 |
| Benzyl Butyl Phthalate | 625 | 10 |
| Bis(2-Chloroethoxy) Methane | 625 | 10 |
| Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether) | 625 | 10 |
| Bis(2-Chloroisopropyl) Ether | 625 | 10 |
| Bis(2-Ethylhexyl) Phthalate | 625 | 10 |
| Chrysene | 625 | 5 |
| Dibenz(a,h)Anthracene | 625 | 5 |
| Diethyl Phthalate | 625 | 10 |
| Dimethyl Phthalate | 625 | 10 |
| Di-n-Butyl Phthalate | 625 | 10 |
| Di-n-Octylphthalate | 625 | 10 |
| Fluoranthene | 625 | 10 |
| Fluorene | 625 | 10 |
| Hexachlorobenzene | 625 | 5 |
| Hexachlorobutadiene | 625 | 10 |

## Table 4.1.12

**ASSET Program Semi-Volatile Organic Compounds analyte list with method and detection limits.**

| Compound | Method | Detection Limits (µg/L) |
|---|---|---|
| Hexachlorocyclopentadiene | 625 | 10 |
| Hexachloroethane | 625 | 10 |
| Indeno(1,2,3-c,d)Pyrene | 625 | 5 |
| Isophorone | 625 | 10 |
| Naphthalene | 625 | 10 |
| Nitrobenzene | 625 | 10 |
| n-Nitrosodimethylamine | 625 | 10 |
| n-Nitrosodi-n-Propylamine | 625 | 10 |
| n-Nitrosodiphenylamine | 625 | 10 |
| Pentachlorophenol | 625 | 5 |
| Phenanthrene | 625 | 10 |
| Phenol | 625 | 10 |
| Pyrene | 625 | 10 |

## Table 4.1.13

**ASSET Program Pesticide and PCB analyte list with method and detection limits.**

| Compound | Method | Detection Limits (µg/L) |
|---|---|---|
| Aldrin | 608 | 0.01 |
| alpha BHC (Alpha Hexachlorocyclohexane) | 608 | 0.05 |
| alpha Endosulfan | 608 | 0.01 |
| alpha-Chlordane | 608 | 0.05 |
| beta BHC (beta Hexachlorocyclohexane) | 608 | 0.05 |
| beta Endosulfan | 608 | 0.02 |
| Chlordane | 608 | 0.20 |
| delta BHC (delta Hexachlorocyclohexane) | 608 | 0.05 |
| Dieldrin | 608 | 0.02 |
| Endosulfan Sulfate | 608 | 0.10 |
| Endrin | 608 | 0.02 |
| Endrin Aldehyde | 608 | 0.10 |
| Endrin Ketone | 608 | 0.10 |
| gamma BHC (Lindane) | 608 | 0.05 |
| gamma-Chlordane | 608 | 0.05 |
| Heptachlor | 608 | 0.01 |
| Heptachlor Epoxide | 608 | 0.01 |
| Methoxychlor | 608 | 0.50 |
| p,p'-DDD | 608 | 0.10 |
| p,p'-DDE | 608 | 0.10 |
| p,p'-DDT | 608 | 0.02 |
| PCB-1016 (Arochlor 1016) | 608 | 0.20 |
| PCB -1221 (Arochlor 1221) | 608 | 0.20 |
| PCB -1232 (Arochlor 1232) | 608 | 0.20 |
| PCB -1242 (Arochlor 1242) | 608 | 0.20 |
| PCB -1248 (Arochlor 1248) | 608 | 0.20 |
| PCB -1254 (Arochlor 1254) | 608 | 0.20 |
| PCB -1260 (Arochlor 1260) | 608 | 0.20 |
| Toxaphene | 608 | 0.30 |

# GLOSSARY

Agriculture – Agriculture involves the use of water for crop spraying, irrigation, livestock watering, poultry operations and other farm purposes not related to human consumption.

Clean technique metals analysis – an integrated system of sample collection and laboratory analytical procedures designed to detect concentrations of trace metals below criteria levels and eliminate or minimize inadvertent sample contamination that can occur during traditional sampling practices.

Degree of support – The level at which water quality supports the designated uses of a water body specified in the Louisiana Water Quality Standards. The degree of support is divided into two levels: fully supporting uses and not supporting uses.

Designated water use – A use of the waters of the state as established by the Louisiana Water Quality Standards. These uses include primary contact recreation (PCR), secondary contact recreation (SCR), fish and wildlife propagation (FWP), drinking water supply (DWS), outstanding natural resource waters (ONR), oyster propagation (OYS), agricultural activities (AGR), and limited aquatic life and wildlife (LAL). (See also Use Support.)

Dissolved oxygen – The amount of oxygen dissolved in water, commonly expressed as a concentration in terms of milligrams per liter, mg/L.

Drinking water supply – A surface or underground raw water source which, after conventional treatment, will provide safe, clear, potable, and aesthetically pleasing water for uses which include but are not limited to, human consumption, food processing and cooking, and as a liquid ingredient in foods and beverages.

Effluent – Wastewater discharged to waters of the state.

Effluent limitation – Any applicable state or federal quality or quantity limitation which imposes any restriction or prohibition on quantities, discharge rates, and concentrations of pollutants which are discharged into waters of the state.

Effluent-limited segment – Any stream segment where water quality is meeting and will continue to meet applicable water quality standards or where there is adequate demonstration that water quality will meet applicable standards after the application of effluent limitations required by the Clean Water Act, as amended.

Evaluated waters – Water bodies for which assessment is based on information other than current site-specific ambient data, such as data on land use, location of pollutant sources, fisheries surveys, fish kill investigations, spill investigations, and citizen complaints.

Existing use – Those uses actually attained in the water body on or after November 28, 1975. They may or may not be designated uses.

Fecal coliform – Gram negative, non-spore forming, rod-shaped bacteria found in the intestinal tracts of warm-blooded animals.

Fish and wildlife propagation – Fish and wildlife propagation includes the use of water for preservation and reproduction of aquatic biota such as indigenous species of fish and invertebrates, as well as reptiles, amphibians, and other wildlife associated with the aquatic environment. This use also includes the maintenance of water quality at a level that prevents contamination of aquatic biota consumed by humans.

Limited Aquatic Life and Wildlife – A subcategory of fish and wildlife propagation that recognizes not all water bodies are capable of supporting the same level of species diversity and richness. Examples of water bodies to which this may be applied include intermittent streams and manmade water bodies that lack suitable riparian structure and habitat.

Monitored waters – Water bodies for which assessment is based on current site-specific ambient data.

Naturally dystrophic waters – Waters which are stained with organic material and which are low in dissolved oxygen due to natural conditions.

Nonpoint source – A diffuse source of water pollution that does not discharge through a point source or pipe, but instead flows freely across exposed natural or manmade surfaces, such as plowed fields, pasture land, construction sites, and parking lots.

Outstanding natural resource waters – Outstanding and natural resource waters include water bodies designated for preservation, protection, reclamation, or enhancement of wilderness and aesthetic qualities and ecological regimes, such as those designated under the Louisiana Natural and Scenic Rivers System or those designated by the Office of Environmental Compliance as waters of ecological significance. This use designation applies only to the water bodies specifically identified in Louisiana's numerical criteria, LAC 33:IX.1123, Table 3, and not to their tributaries or distributaries, unless so specified.

Oxygen-demanding substances – Organic matter or materials in water or wastewater which utilize oxygen during the decomposition process, and inorganic material, such as sulfides, which utilize oxygen during the oxidation process.

Oyster propagation – The use of water to maintain biological systems that support economically important species of oysters, clams, mussels, or other mollusks so that their productivity is preserved and the health of human consumers of these species is protected. This use shall apply only to those water bodies named in the numerical criteria tables and not to their tributaries or distributaries unless so specified.

Point source – A discernible, confined and discrete conveyance including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

Potentiometric surface – An imaginary surface representing the total head of groundwater in a confined aquifer that is defined by the level to which water will rise in a well.

Primary contact recreation – Any recreational activity which involves or requires prolonged body contact with the water, such as swimming, water skiing, tubing, snorkeling, and skin-diving.

Riparian – Area of land along the banks of a stream which often exhibits slightly different vegetation and habitats than the surrounding landscape. Because of this variation, riparian areas are considered valuable wildlife habitat and important for the protection of water quality.

Subsegment – A named regulatory water body as defined by LAC 33:IX.1123. They are considered representative of the watershed through which they flow and, therefore, have numerical criteria assigned to them. This is the level of watersheds at which § 305(b) assessments are applied. Each subsegment has a six-digit number assigned in the following manner, 03=basin, 01=segment, 01=subsegment. This would be read as 030101, which represents Calcasieu River-headwaters to Highway 8. For mapping purposes, the subsegment is defined as a polygonal geographical area using GIS (Geographic Information System).

Secondary contact recreation – Any recreational activity which may involve incidental or accidental body contact with the water and during which the probability of ingesting appreciable quantities of water is minimal, such as fishing, wading, and recreational boating.

Toxic substances – Any element, compound or mixture which at sufficient exposure levels induces deleterious acute or chronic physiological effects on an organism.

Wastewater – Liquid waste resulting from commercial, municipal, private, or industrial processes. This includes but is not limited to, cooling and condensing waters, sanitary sewage, industrial waste, and contaminated rainwater runoff.

Water body – Any contiguous body of water identified by the state. A water body can be a stream, a river, a segment of a stream or river, a lake, a bay, a series of bays, or a watershed.

Water quality-limited segment – Any stream segment where the stream does not meet applicable water quality standards or will not meet applicable water quality standards even after application of the effluent limitations required by the Clean Water Act, as amended.

Use support – A determination made by LDEQ as part of the Integrated Report process of whether or not a designated water use is being supported or met based on an analysis of water quality data or other information. Support statements include “Fully Supported,” “Not Supported,” and “Not Assessed” (See also Designated Water Use).

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LAC. See Louisiana Administrative Code.

LDCRT. See Louisiana Department of Culture, Recreation, and Tourism.

LDEQ. See Louisiana Department of Environmental Quality.

LDWF. See Louisiana Department of Wildlife and Fisheries.

LEQA. See Louisiana Environmental Quality Act.

LOSP. See Louisiana Office of State Parks.

LOT. See Louisiana Office of Tourism.

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USFWS. See U.S. Fish and Wildlife Service.

# APPENDIX A: 2018 Integrated Report of Water Quality in Louisiana

Appendix A is taken from the 2018 ATTAINS system, which contains all water quality assessments for the state. All suspected causes of impairment and suspected sources of impairment are linked in a one to one fashion, meaning, a reported suspected cause of impairment is believed to be affected by the suspected source of impairment provided on the same line of the table. However, as a result of this linking, some suspected causes and/or sources may be listed more than once for a given water body subsegment. This results in cases where a suspected cause of impairment has two or more suspected sources of impairment. Likewise, if a suspected source of impairment affects two or more suspected causes of impairment, the suspected source will be listed more than once. This is important to note in order to prevent double counting when attempting to develop subtotals for the size or number of water bodies affected by a given suspected cause or suspected source of impairment.

The full text of Appendix A, including subsegment assessment maps for each basin can be found in the document 18_IR1-Appendix A Text and Maps.

The full water quality assessment table is contained in Appendix A in the document 18_IR1-FINAL-Appendix A-All Assessments.

# APPENDIX B: 2018 Integrated Report of Water Quality in Louisiana – Category 1 Addendum

Appendix C, the 2018 Integrated Report, Category 1 Addendum, contains those water body impairment combinations (WICs) that were removed from LDEQ's 2018 Integrated Report during its development. The WICs were removed because the suspected cause is no longer considered to be impairing water quality of the water body subsegment or as a clarification of impairment causes. Removal may be based on more recent water quality data collected after development of the 2018 Integrated Report, or due to advances in water quality assessment that permit more accurate determinations of water quality. This information does not constitute a formal § 303(d) or § 305(b) submittal, nor is this Category 1 listing a requirement of the Clean Water Act.

The full Category 1 table is contained in Appendix B in the document 18 IR1-FINAL-Appendix B.

# APPENDIX C: Complete list of suspected causes of impairment and cause descriptions used in USEPA's Assessment Database

The full list of suspected causes of impairment is contained in Appendix C in the document 18 IR1-FINAL-Appendix C-Causes.

# APPENDIX D: Complete list of suspected sources and source descriptions used in USEPA's Assessment Database

The full list of suspected sources of impairment table is contained in Appendix D in the document 18 IR1-FINAL-Appendix D-Sources.

# APPENDIX E: Complete Listing of Louisiana's Ambient Surface Water Quality Network Sites

The full list of ambient surface water quality network sites is contained in Appendix E in the document 18 IR1-FINAL-Appendix E-Monitoring Sites. Not all sites contained in this list are currently sampled as part of LDEQ's rotating monitoring sites program.

# APPENDIX F: Public Comments on the 2018 Integrated Report and LDEQ's Response to Comments

Appendix F is a compilation of all comments received regarding the 2018 Integrated Report, along with LDEQ's response to those comments. Any changes made to the 2018 Integrated Report based on public comments are noted in the column titled, "Summary of LDEQ Responses." Also included in this response are changes made to the 2018 Integrated Report during the review period following public notice.

The full summary of public comments and LDEQ's responses is contained in Appendix F in the document 18 IR1-FINAL-Appendix F-Response to Comments.

# APPENDIX G: Louisiana's 2018 Section 303(d) List

Appendix G represents a subset of Louisiana's 2018 Integrated Report (IR) and includes only those water body impairment combinations (WICs) reported as Categories 5 or 5RC. As has been noted in the body of the IR text, WICs in Categories 5 and 5RC of the IR assessments are the only WICs on Louisiana's 2018 § 303(d) List. This table was developed only as an aid to the public and does not constitute Louisiana's "official" § 303(d) List. Every effort was made to maintain consistency between Appendix A Categories 5 and 5RC WICs and Appendix F. ***However, in order to ensure the accuracy of the overall Integrated Report, only those WICs in Appendix A, Categories 5 and 5RC, constitute the "official" § 303(d) List.***

The full table of § 303(d) Listed WICs, with the caveat noted above, is contained in Appendix G in the document 18 IR1-FINAL-Appendix G-Cat 5 303d List.